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China Report

ECONOMIC AFFAIRS

No. 356

ENERGY: STATUS AND DEVELOPMENT --XVII

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CHINA REPORT

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No. 356

ENERGY: STATUS AND DEVELOPMENT --XVII

NEW NEI MONGGOL MINES, SLURRY PIPELINES TO HELP EASE ENERGY SHORTAGE

Hong Kong MING PAO in Chinese 1 May 83 p 11

[Article: "Nei Monggol Steps Up Development of Four Big Open-pit Coal Mines"]

[Text] China is now intensifying the development of its energy resources, especially the exploitation of coal in North China, the northwest and the southwest. According to news releases from Hohhot, Nei Monggol is accelerating construction on four large-scale open-pit coal mines in an effort to get them into production at the earliest possible date and increase the supply of coal to various regions. The four big coal mines are located in Jungar, Huolinhe, Yuanbaoshan, and Yiminhe.

Plants Forced To Close 3 Days a Week Due to Insufficient Coal-fired Electric Power

The Chinese newspapers had been boasting about the country's abundant energy resources, especially the amount of petroleum produced, but the fact of the matter is that energy resources on the Mainland are in short supply, whether for industry or for the populace. Oil, coal, and electric power are all too scarce to meet demands. The Beijing monthly, "ECONOMIC RESEARCH," recently revealed that many factories and mines have yet to resolve the problem of "three off, four on" [i.e., operating only 4 days a week because of energy shortages]. The economic loss is enormous.

The Chinese papers are now running self-criticisms on the fallacy of this past boasting about energy resources, acknowledging the adverse impact on the economy of this energy "crisis." Why is energy in short supply? The major reason is that the past economic development plans and policies were incorrect, with too little investment made in energy and transportation. As a result, funds and equipment were insufficient, communications and transportation were weak, and energy production could not meet market demands.

Construction of Coal Slurry Pipelines Would Ease Burden on Railroads

China does have vast reserves of coal, but distribution is uneven and most of it is concentrated in Shanxi and Nei Monggol in regions where there is practically no heavy industry. In eastern China, in regions where the level of industrial technology is fairly high, the production of machinery cannot be fully developed because there, coal is in short supply.

After the coal is mined, it must be shipped to ports by rail and then by ship or truck to its final destination. However, the load capacity of the Mainland's transportation [system] is not high and the railroads have a hard time shipping the coal. China now plans to build coal slurry pipelines to transport coal from the Jungar coal fields in Nei Monggol, north of Shaanxi Province, across Shanxi and Hebei to the port of Qinhuangdao. This scheme could reduce the burden on the railroads, but coal slurry pipelines aren't cheap. A lot of money is needed and the Mainland ain't exactly flush at the moment. It'll probably be another 3 years or more before this paradox is resolved.

CSO: 4013/214

NEED TO APPLY UNIVERSAL ENERGY CONSUMPTION STANDARDS REITERATED

Beijing RENMIN RIBAO in Chinese 24 Apr 83 p 5

[Article by Zhang Xingduan [1728 5887 4551]: "We Must Attach Great Importance to Formulating and Implementing Energy Standards"]

[Text] Correct formulation and implementation of energy standards are important investment-saving and rapidly effective measures in energy conservation work.

In the past, there have been no standards stipulating the quality of water introduced into low-pressure boilers in China's industrial ore enterprises. This resulted in scale on the inside walls of boilers of an average of 3 to 6 mm in thickness, with 10 million tons of fuel being wasted each year. Since 1979, after the state issued "Water Quality Standards for Low-Pressure Boilers," many enterprises have pre-treated water for use in boilers in accordance with these standards, with scale on boiler walls generally being decreased to 1 to 3 mm and with the amount of steam produced by 1 ton of coal increasing from 7 tons to 9 tons. Initial calculations indicate that more than 4 million tons of coal can be saved a year after full implementation of the standards in medium-sized and small low-pressure boilers throughout the nation.

Each piece of cast pig iron produced according to the old standards at the First Iron Plant of the Benxi Iron and Steel Company weighed 40 kg. The pieces of iron were big and energy consumption was high when the users melted them. The plant set out from an overall standpoint of saving energy. By consulting foreign standards, they decreased the specifications for each piece of pig iron from 3 to 7 kg. Calculated on the basis of the annual production of this plant of 280,000 tons of iron, the users can save more than 3,300 tons of coke and more than 6.3 million kilowatt-hours of electricity a year. The revised standards for small pieces of iron made by this plant have now been incorporated into the national standards. If other iron plants can produced small pieces of iron in accordance with these standards, users will be able to save hundreds of thousands of tons of coke and hundreds of millions of kilowatt-hours of electricity a year.

Over the past 2 years, China has drawn up more than 100 standards in such areas as energy bases, energy-saving products, and energy management, with

marked energy-saving effects being obtained. However, energy standardization work is just beginning and there is a great deal of work that must be done both in formulating standards and in implementing them. To summarize the opinions of concerned comrades, attention should be given to the following points:

We must formulate standards for the development and utilization of energy as quickly as possible. Because there are no standards for coal products, production and marketing do not meet needs. The electric power sector needs powdered coal but is supplied large quantities of raw coal. Railroad locomotives must burn lump coal but more than 50 percent of the coal they are supplied is mixed raw coal and powdered coal. This results in very low energy utilization rates.

We must formulate technical standards for energy-consuming equipment as quickly as possible. Advanced energy-consumption standards should definitely be formulated for and attained by newly produced energy-consuming equipment. We cannot on the one hand produce large quantities of "coal tigers" and "oil tigers" and on the other hand make investments to carry out their technological transformation. We should establish lower limit energy consumption standards for outmoded energy-consuming equipment. Those that cannot meet these standards should be replaced as they become obsolete.

We must do a good job of comprehensive standards for energy management. The existing energy supply and consumption quotas are the amounts actually consumed in the past year from which the planned savings have been subtracted. As the result, the better a job an enterprise does of energy-saving work, the more difficult it will be to save energy and the less opportunity there will be for reward and evaluation as advanced. This results in the irrational phenomenon of "whipping a fast ox." Rational comprehensive standards of energy management must be formulated through investigation and research and determinations of energy balance among enterprises. By strengthening energy-saving indicators and numerical comparability, we can genuinely succeed in rewarding the excellent and penalizing the inferior.

We must both emphasize formulation of standards and implementation of energy standards in all enterprises. Practice demonstrates that to do a good job of energy standardization work we will first have to see to it that they are taken seriously at all levels of leadership, and, secondly, local standardization organs must be fully brought into play.

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CSO: 4013/201

NATIONAL POLICY

FUJIAN PLANS BALANCED DEVELOPMENT OF HYDRO, THERMAL POWER

Fuzhou KEXUE YU WENHUA [SCIENCE AND CULTURE] in Chinese, No 1, 25 Jan 83, pp 2-4

[Article by Hu Xilan [5170 6932 5695], senior engineer of the Fujian Provincial Hydropower Department: "The Bright Future of Fujian's Electric Power Resources"]

[Text] The development of electric power is directly related to the rate of growth of our national economy and the degree of modernization. At present, among the total amount of commercial energy consumed in our nation, electric power constitutes about 20 percent, while in economically developed nations of the world, the consumption of electric power constitutes 30 to 40 percent of the total consumption of energy. The proportion of electric power in the total amount of energy is an important indicator of the degree of social and economic modernization.

The present use of electric power in Fujian Province is still at a low level. The whole province now generates about 5 billion kilowatt-hours of electricity a year. The annual per capita average is only 200 kilowatt-hours, while the national annual per capita average is 300 kilowatt-hours. Based on the requirement of more than quadrupling the industrial and agricultural production values by the end of this century in Fujian, the annual output of electricity must teach the goal of 25 to 30 billion kilowatt-hours. In this regard, our task is extremely difficult! What are the ways to solve the energy problem in Fujian?

Electricity From the Rivers

Fujian is backed by mountains and faces the sea. The climate is damp, and rivers and streams flow swiftly. They have a rich reserve of hydraulic resources. According to general surveys, the 120,000 square kilometers of the province have a reserve of 10,000,000 kilowatts of hydraulic power, an average of 84 kilowatts per square kilometer. This compares favorably with Norway, Sweden, and New Zealand which are world famous for their hydroelectric power. The hydraulic resources can be built into more than 1,000 large and small hydroelectric power stations with a total capacity of 7 million kilowatts. Under average hydrological conditions, they can provide 32 billion kilowatt-hours of electricity each year. These large and small

hydroelectric power stations will be distributed on the 12 major rivers and their estuaries throughout the province. On the main stream of the Min Jiang, on the main tributaries of the Jian Xi and the Sha Xi of the Min Jiang, and on the Ding Jiang, four large hydroelectric power stations can be built, providing 9.5 billion kilowatt-hours of electricity a year. The others are medium and small hydroelectric power stations. At present, only 12 percent of this resource has been developed and utilized. Hydroelectric power can provide clean and regenerative energy. With detailed designs, a higher rate of utilization and economic benefits can be obtained. The building of hydroelectric power stations can be combined with flood prevention, irrigation, shipping, transport of timber, cultivation, and beautification of the environment. Undoubtedly, before the end of this century, the major source of electric power in Fujian will have to be taken from the development of hydraulic resources in a big way.

Developing Thermoelectric Power in Mountain Regions

In the present structure of electric power in Fujian Province, hydroelectricity constitutes about 65 to 70 percent, thermoelectric power fired by fuel coal constitutes about 30 to 35 percent. It seems that such a ratio will persist for a very long time.

The development of large-scale thermal power plants must consume large quantities of coal resources and they easily pollute the environment. Can we satisfy the need for electricity by relying entirely on hydroelectric power? We cannot. This is because rainfall in Fujian is concentrated at the end of spring and the beginning of summer. The total runoff of the large and small rivers each year throughout the province is 120 billion cubic meters, and about 60 percent falls within this one-third of the year. Even if various difficulties are overcome, and even if we build some reservoirs at the upper reaches of the rivers, the total capacity of the reservoirs that can be built to store water for more than a quarter is only about 20 billion cubic meters, and storing such a large capacity will cost a lot in cultivated land which will be flooded.

A more feasible method is to utilize a part of the fuel provided by the province's coal mines to build a number of thermal power plants as a supplement to hydroelectric power, and jointly operate hydroelectric and thermoelectric power. The construction of thermal power plants generally requires less investment. The construction cost per kilowatt is about half that for a hydroelectric power station and the construction period is shorter. Appropriately building some themmal power plants will benefit the acceleration of the progress in building up electric power. Thermal power plants built near cities or industrial zones can also help stabilize the voltage in the regions where the use of electric power is concentrated, and "heat and electric power stations" can be built according to the need for heat in industry and in living to provide both electricity and hot steam or hot water so that the efficiency of utilization of fuel coal can be increased.

Small-scale Hydroelectric Power--An Important Wealth

Among the hydroelectric power stations with a capacity of 7 million kilowatts that can be built in Fujian Province, over 30 percent must be built on small streams in the mountain regions. The scale is generally under 10,000 kilowatts. If all are developed, they can provide more than 9 billion kilowatt-hours of electricity each year. This is an important wealth in energy in Fujian Province. Only 16 percent of these resources have been utilized at present.

Although the output of electricity provided by small hydroelectric power stations is small, if they are joined together, small amounts can be concentrated to form a large amount and the work required is not large, management is convenient, and especially when built in the rural areas everywhere, they can be closely combined directly with local and regional economic development. For example, Dehua County at the foot of Daiyunshan is one of Ching's three ancient "porcelain capitals". Now, it is still the main producing base of our province's pottery and porcelains and handicraft porcelains for export. For several years, they tried to overcome technical difficulties in using electric heating to replace the use of oil, coal, and firewood to fire various types of pottery and porcelains. They developed several types of electric kilns, tentatively demonstrating the feasibility and the bright future for this reform in the technological process of making pottery and porcelain. Dehua is a county with rich small-scale hydroelectric power resources. If electrical heating is used on a widespread basis to replace the firing of porcelain by pine, the surplus electricity during the season of abundant water can also be utilized to smelt iron. Another important wealth here--trees--can be rationally developed so that all materials can be fully utilized, and water conservancy resources will thus be protected. The gains from pottery and porcelain, smelting iron and forestry products can accumulate funds for the continued development of small scale hydroelectric power.

There is also a bright future in utilizing small-scale hydroelectric power in rural villages in the mountain regions to develop the economy of sideline production of communes and brigades and stimulate farmers to become rich. The Yangwei Brigade of the Qingyuan Commune, Shouning County, at the foot of Tailaoshan, mainly engages in planting tea as a sideline. The preliminary production of tea originally relied entirely on firewood for roasting. This year, they tested the use of electric heating to replace firewood to produce tea. More than 1,400 dan of firewood were conserved and benefits in reducing cost and improving quality were realized. The tea harvesting season is the season of abundant water. Small hydroelectric power with surplus electricity needs an outlet. This brigade thus increased net profits by more than 10,000 yuan. Daci Commune, Longyan County has coal and limestone resources. They used surplus electricity from small-scale hydroelectric power to manufacture calcium carbide. Each year, 30,000 to 40,000 tons of calcium carbide could be submitted and sold to the provincial chemical industry department. Over the past several years, 500,000 yuan in profits were submitted. There is a saying popular throughout the countryside in the mountain regions: In order to become rich, ways must be created; in order to have money, develop electricity!

At present, household electrical appliances are gradually entering rural households. Farm villages with surplus electricity are popularizing the use of electric heating for cooking. Small-scale hydroelectric power is serving a greater and greater function in changing the material and cultural life in the broad number of rural villages of the mountain regions.

The Establishment of Power Networks Throughout the Province

Fujian Province has preliminarily formed a province-wide power network. It connects more than 40 counties. But there are still many localities with electric power systems that are isolated. The proportion of small-scale hydroelectric power grids that have been linked to the large network is especially small. The structure of the power network is still weak. As electric power develops, the facilities to generate electricity, to supply electricity and to use electricity throughout the province must be gradually linked with the power network to truly form a grid so that all localities in the province can have a highly reliable and economic energy source.

The coastline of Fujian Province constitutes about 20 percent of the total length of China's coastline. It is also situated in a region where lunar gravity is stronger. The fall between high and low tides is large, therefore the reserve of tidal energy is also very rich. The wind energy resources here along the coast are being emphasized by energy scholars. The velocity of ocean winds blowing towards the mainland from the East China Sea 40 percent of the year is high enough to generate electricity. Also one of the important subjects in exploring new sources of energy in the world today is to utilize wind energy to generate electricity and provide electric power to the power grid.

Asking the ocean for electric power is still technically not mature enough in Fujian Province at present, and its economic rationality also awaits further exploration, but we should conduct related experiments and studies and conduct technical and economic proof as early as possible in order to welcome greater economic development in the future.

We Must Overcome Scientific and Technical "Difficulties"

The development of electric power in Fujian Province has a bright future. We have every reason to believe that as long as we follow the direction pointed out by the 12th Party Congress we will surely provide sufficient electric power for economic restoration. But the way to develop electric power in Fujian Province has its own characteristics. We cannot copy the experience in developing electric power in foreign nations or in other provinces. For example, the development of hydraulic resources, the full utilization of small-scale hydroelectric power, the use of our province's anthracite which has a low volatile content, the optimal joint operation of hydroelectric power and thermal power, the establishment of a modern unified power network that combines the large, the medium, and the small all have a series of scientific and technical "difficulties" that require us to overcome one by one, and most should be overcome in the 1980s. This is the most urgent task at present to realize a new economic restoration.

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CSO: 4013/172

NATIONAL POLICY

SHANXI COAL PLAYS VITAL ROLE IN OVERALL NATIONAL ECONOMY

Taiyuan SHANXI RIBAO in Chinese 11 Feb 83 p 1

/Article by Luo Guibo /5012 6311 3134/, Governor of Shanxi Province: "Fully Developing Shanxi's Superiority in Coal, Heavy Industry, Chemical Industry"/

/Excerpt/ Shanxi Province is situated west of the Taihangshan in the middle reaches of the Huang He. It has a total area of more than 156,000 square kilometers and a population of 25,300,000. The province is rich in coal, iron, aluminum, copper, and other natural resources, and its coal resources are especially famous.

Known as the "home of coal", in the national arrangement of economic development Shanxi is an important energy, heavy industry, and chemical industry base.

Our Party's 12th Congress has decided on the general goal for our nation's economic buildup from 1981 to the end of this century. This goal is to strive to quadruple the total annual production value of industry and agriculture of the whole nation while continuing to improve economic benefits. According to this requirement, by the end of this century, Shanxi's total annual production value in industry and agriculture will increase from 17 billion yuan in 1980 to 68 billion yuan. Given our actual situation, we can, with effort, achieve this goal.

Our coal resources are uniquely superior. This is a very favorable condition to develop Shanxi's economy. The known coal reserves throughout the province amount to more than 200 billion tons, constituting one-third of the national total. The annual output is over 140 million tons, constituting nearly one-fifth the national total. Each year, more than 90,000,000 tons of coal are shipped to other places, constituting three-fifths of the national total. It is expected that by the end of this century, the annual coal output can exceed 300 million tons, and the annual amount shipped out will increase to over 200 million tons. Fully developing and utilizing our province's coal resources will not only forcefully support the overall development of agriculture, industry, culture, education, science and technology, and hasten the realization of the progress in quadrupling, it also has an important meaning in the overall economic development of the nation.

Our province has a strong industrial foundation. This is another favorable condition for pormoting economic development. After more than 30 years of buildup, our province's industry has acquired a relatively large scale. Especially the productive capability of such heavy industries as coal, machinery, metallurgy, electric power ranks high nationally. The total industrial production value of the province constitutes over 70 percent of the total production value of industry and agriculture. Using the existing foundation to hasten the development of industry itself is very important in realizing the goal of quadrupling the total production value in industry and agriculture.

Shanxi's economic potential is great. In industry, each production sector is still in the unrefined stage of utilizing its own natural resources, technical standards and economic management standards are low, and economic benefits are poor. Therefore, there is a great potential for development. We calculated that within the first 10 years, if our province's production value per 100 yuan of fixed assets can reach the current national average, taking the actual amount for 1981 as the basis of our calculations, then the production value can increase 6.6 billion yuan, and if it can reach the current advanced national level by the end of this century, then the production value can be increased by more than 20 billion yuan. The potential in agriculture is also great. The per capita area of land throughout the province is nearly 10 mou. Especially in the mountain regions which constitute three-fourths of the total area of the province, biological resources are very abundant. As long as we fully develop and utilize these economic resources, they will serve greatly to realize quadrupling.

In addition, quadrupling in 20 years requires an average annual growth of 7.2 percent. We had reached this rate of development before. During the 30 years from 1949 to 1979, Shanxi's total industrial and agricultural production value grew nearly ten times, averaging an annual growth rate of 8.3 percent. After the Party's Third Plenum, our economic buildup has gradually progressed towards healthy development. Before 1990, the rate of development may be slightly lower in order to establish a good foundation for economic restoration. But after 1990, the rate of development of industrial and agricultural production will surely accelerate.

The correctness of the lines, principles and policies of the Party Central Committee is an important guarantee for realizing the strategic goal of quadrupling in 20 years. After the Third Plenum of the 11th Congress, we ended the long period of social upheaval through bringing order out of chaos and realized stability and unity within the province. The emphasis of the work of the whole party has shifted to economic buildup. At the same time, we also corrected the guiding ideology in economic work by summarizing the experience and lessons in economic buildup since founding of the nation. We shifted the emphasis from the pursuit of the rate of growth in production value towards seeking economic benefits and giving people added benefits Practice proves that this is a very effective new way of economic buildup and social development that suits the actual situation in our province and has provided a reliable guarantee for future economic development.

In reviewing history and in looking forward, we are confident in creating a new situation in Shanxi. But, we must also clearly see that to realize quadrupling in 20 years is indeed not an easy task. Therefore, we must follow the key strategies and strategic steps proposed by the Party Central Committee and the State Council. We must look toward the future while establishing ourselves in the present. We must concretely establish the foundations of the first 10 years to create conditions for economic recovery in the last 10 years.

First we must hasten the buildup of the energy, heavy industry, and chemical industry base. We must exert efforts to comprehensively develop base. We must exert efforts to comprehensively develop coal, electricity and chemistry and improve the rate of utilization of coal resources. We will rely on current technical improvement of enterprises and renovation of equipment, improve the degree of modernization, do the work in the conversion and comprehensive utilization of energy well, and through simultaneous efforts to develop the large, the medium and the small, we must allow state-operated uniformly equipped mines, local coal mines and commune and brigade coal mines to develop. As the large mines at Datong, Yangquan, Gujiao, Jincheng, and Luan are expanded, as the Pingsuo open-pit coal mine is built, and as local and commune and brigade coal mines are technically improved, the whole province's coal production capability can increase by more than 10,000,000 tons a year. On the basis of increasing the output of coal, we must also continue to improve the depth of coal processing and increase new varieties, so that they will develop a greater benefit. The chemical industry must rely on the superior of coal, greatly develop a coal chemical industry to provide large amounts of chemical products and second energy sources for the state, and gradually grasp new types of gasification and liquefaction of coal and such technology and technical processes in advanced fields. Electric power buildup must also develop greatly. Besides continuing to complete construction of some power plants, we also plan to built a number of new thermoelectric power plants so that the whole province's installed capacity for generating electric power can be increased from the current 2.67 million kilowatts to 15 million kilowatts by the end of this century. The technical improvement of the machinery industry must be carried out first so that it can provide more and better modern technical equipment for the coal industry, light industry, and agriculture. In addition, we must correspondingly manage well the coordinated development of light industry so that the economic structure can be made more rational to satisfy the needs of the material and cultural life of the people. Traffic and transportation are weak links in Shanxi's economic development. Besides the new railroad trunk lines built by the state, we plan to build some provincial railroads and greatly develop highway construction to solve the difficulties in the shortage of transport capability for coal and other materials. Shanxi has a shortage of hydraulic resources. This has become an outstanding conflict in economic buildup. For this, we are actively taking effective measures to tackle the development and utilization of hydraulic resources and water conservation so that the problem of water can be gradually and concretely solved.

At present, in accelerating industrial development, we must continue to implement the principle of readjustment of the national economy, grasp

technical improvement and reorganization of enterprises, reform the economic system according to plan and step by step, further perfect the economic responsibility system, improve the businss management level, and shift the overall economic work towards improving economic benefits. The more we do the more we can guarantee the realization of quadrupling.

Second, taking the development and buildup of the mountain regions to hasten agricultural development is still one of the key points in Shanxi's work. We must gradually realize self-sufficiency in food grains, actively develop diversification, concentrate on the development of forestry, animal husbandry, and the processing industry. At the same time, we must greatly increase vegetation and control soil erosion so that the ecological system can gradually be converted to a benign cycle. We must stimulate the development of production in the plains through the development of the mountain regions. At present, we should continue to relax policy, by daring in reform, further stabilize, perfect, and improve the agricultural production responsibility system and stimulate a faster development in agricultural production.

Third, in order to quadruple the total annual production of industry and agriculture in our province, we must to a large degree rely on the development of science and technology. For this, we must fully develop the great role of science and technology. While exerting efforts to popularize current scientific and technical achievements, we must organize scientific and technical achievements, we must organize scientific and technical personnel to overcome difficulties in the key scientific research projects in the buildup of industrial and agricultural production based on the needs in our province's economic and social development, and we must strive to realize visible achievements in the Sixth Five-year Plan and the Seventh Five-year Plan periods so that new technology, and new ac ievements can be popularly applied. We must promote ambitious scientific and technical people to important posts, and fully develop their capabilities. We must emphas ze the development of talent and the term of intellectu ls. At the same time, we must learn from technically advanced provinces, cities and regions, and actively carry out technical cooperation and technical exchange to push forward the further development of Shanxi's economy and science and technology.

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NATIONAL POLICY

FORCES BEING ASSEMBLED TO ACCELERATE CONSTRUCTION ON SHANXI ENERGY BASE

Beijing RENMIN RIBAO in Chinese 2 May 83 p 1

/Article by reporter Xing Fengbing /6717 7364 3521/ /

/Text/ In an effort to accelerate the pace of construction of a regional energy, heavy industry, and petrochemical base centered about Shanxi Province and including Jungar in Nei Monggol, northern Shaanxi, and western Henan, the State Council has created the Shanxi Regional Energy Planning Office and formulated plans to coordinate the various components and regions involved. Recently, this reporter interviewed officials of the Planning Office on the prospects for the plan and how the pace of construction was to be stepped up.

The Grand Strategy for Accelerating China's Energy Construction

The Shanxi-centered energy base has abundant coal reserves. The coal is of high quality, there is a wide range in variety and it is fairly shallow and easy to exploit. The region's coal resources represent 60 percent of the total verified reserves of the entire nation and one-third of the total production volume. Each year, it can supply 85 percent of the commodity coal to some 20 provinces, municipalities and autonomous regions. The base will produce more than 100 million tons of coal which may be shipped out directly or converted into more than 50 billion kilowatt-hours of electricity and then transmitted out of the region. Energy-wise, this will make it possible for the regions using coal and electricity to generate an additional 100 billion yuan in industrial output value. The building of the Shanxi-centered energy base will promote national energy development and guarantee the quadrupling of the overall industrial and agricultural output value before the end of this century--the grand goal of our strategic policy.

Coal, Transportation, Electricity, and Water To Be Developed Simultaneously

To accelerate the development of the Shanxi energy base, it is necessary to reinforce unified planning, and to handle correctly the comprehensive exploitation and use of coal resources and the corresponding build-up of communications and transportation, thermal power generation, and hydraulic resources. The out-shipping of coal, the on-site use of coal to generate electricity, the out-transmission of electricity and the production of products requiring high energy consumption must be integrated, making it possible to produce more

electric power and to transmit more electricity and ship less coal. Of course, the shipping of Shanxi coal will still rely heavily on the railroads and as a result, railroad construction, especially those lines used to export coal, must be handled first. In order to reduce the burden on railroad transportation, there must be a rational division of labor in rail, highway, and water transportation, and better integration of transport capacity to achieve maximum coal export capability. The comprehensive development and use of hydraulic resources must also be pushed forward firmly, to match the pace of development of coal, electricity, transportation, and heavy industry and petrochemicals. The richest coal regions of the base lie along both banks of the Huang He and full utilization of the river's water could solve the energy shortage problem in Shanxi. Feasibility studies as well as technical and economic demonstrations for related projects must be stressed.

All Concerned Departments Must Actively Support Major Construction Projects

The development of an energy base centered about Shanxi is a top-priority item in the overall national energy construction. The project involves many difficult tasks, time is short, and each item must be approached in a conscientious manner. Each of the construction projects must be checked and certified on the spot and carried out in a planned, phased manner. Finalized major construction projects must be stepped up; longer range major projects must also be inspected and certified and the early-stage work completed. All of the construction of the base must be fast and economical with no foot-dragging or disputes. The major construction work must have the active support and coordination of all departments involved as well as the provinces, municipalities, and regions. Organs associated with the big engineering projects, coal, electricity, transportation, and water must organize command units; overall command units must be created for large-scale construction. During the construction of the energy base, care must be taken to reform the economic management system. Relevant economic and technical policies must be studied and enthusiasm fully mobilized.

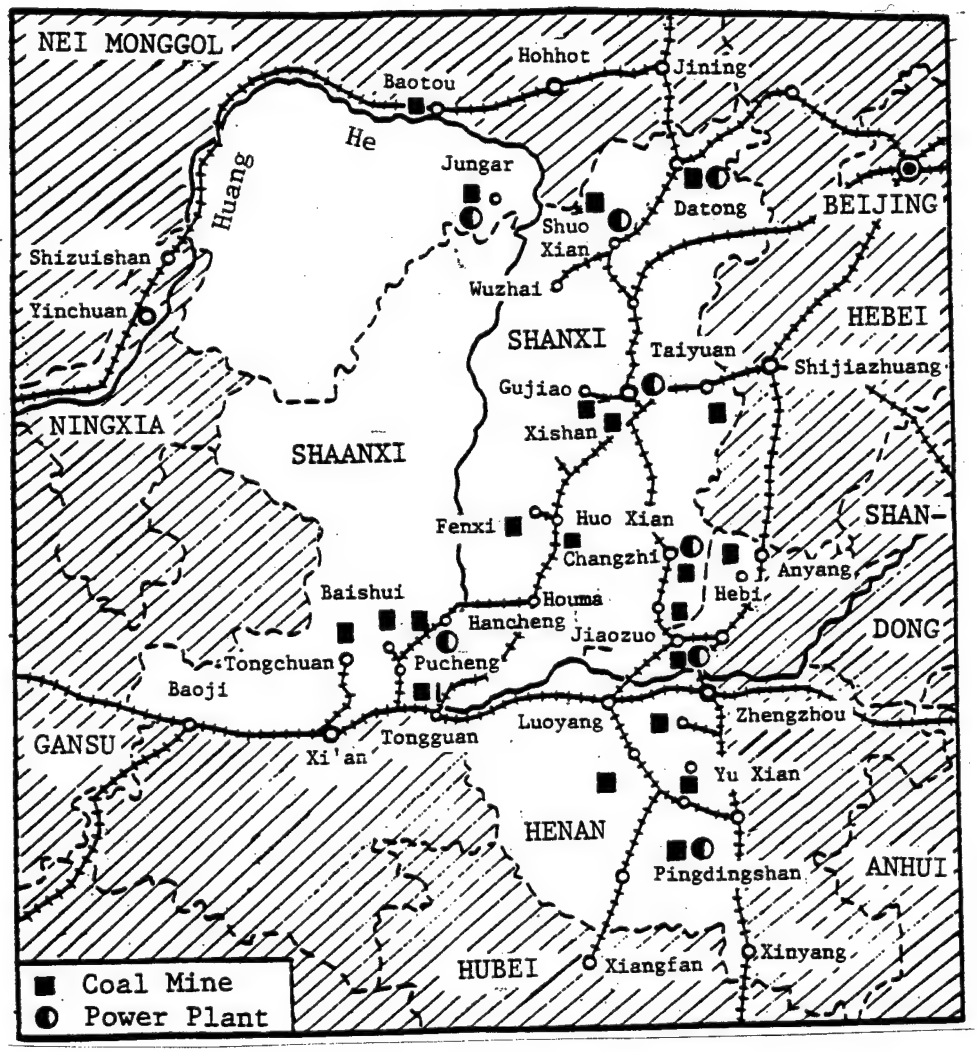
Recently, the leading comrades of related coal, railroad, and electric power organs and the responsible comrades of the Energy Base Planning Office paid a visit to the base to conduct inspections and studies. They listened to opinions from all quarters, giving a better understanding of the planning work of the major construction projects.

CSO: 4013/205

REGIONAL ENERGY SCHEME CENTERS ABOUT SHANXI COAL, POWER PLANT BASE

Beijing RENMIN RIBAO in Chinese 2 May 83 p 1

[Map]



Sketch map showing Shanxi as center of energy infrastructure.

CSO: 4013/205

NATIONAL POLICY

TABLE OF CHINA'S PAST AND PREDICTED ENERGY PRODUCTION

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 2, 10 Feb 83 p 6

	Standard fuel output (10,000 tons)						Percentage of total energy output				
Year	Total	Coal	Oil	Natural Gas	Hydro-Power	Nuclear	Coal	Oil	Natural Gas	Hydro-Power	Nuclear
1952	4871	4714	62	1	94	-	96.8	1.3	-	1.9	-
1957	9860	9357	204	9	290	-	94.9	2.1	0.1	2.9	-
1962	17174	15714	805	161	494	-	91.5	4.7	0.9	2.9	-
1965	18796	16571	1583	146	496	-	88.2	8.4	0.8	2.6	-
1970	39897	25286	4291	382	949	-	81.8	13.9	1.2	3.1	-
1975	48537	34429	10788	1177	2143	-	70.9	22.2	2.4	4.4	-
1980	63721	44274	15150	1898	2399	-	69.4	23.8	3.0	3.8	-
1985 Est.	68310	50000	14280	1330	2700	-	73.	20.9	1.9	4.0	-
1990 Est.	77798	57120	15700	1330	3610	38	73.4	20.2	1.7	4.6	0.1
2000 Est.	115430	82110	21420	2660	7700	1540	71.1	18.6	2.3	6.7	1.3

NOTE: This table presents standard fuel production conversions, not individual original output.

CSO: 4013/191

POWER NETWORK

POWER MINISTRY TO SET UP PILOT PROJECTS FOR 'CHINESE-STYLE' RURAL ELECTRIFICATION

Hangzhou ZHEJIANG RIBAO in Chinese 14 Jan 83 p 1

/Article: "To Develop a Chinese-Style Rural Electrification According to the Important Opinions of the Leading Comrades of the Central Committee, the Ministry of Water Conservancy and Electric Power Decides To Establish Pilot Projects in 100 Counties"/

/Text/ According to a report in "JINGJI CANKAO" published today, the development of Chinese-style rural electrification is a major task that the Ministry of Water Conservancy and Electric Power is carrying out. According to the opinions of the leading comrades of the Central Committee, the Ministry of Water Conservancy and Electric Power has tentatively decided to establish pilot projects in 100 counties first. Minister Qian Zhengying, Vice Minister Li Daigeng /2621 0108 5087/, and some department chiefs have already led related personnel to Anhui, Guangdong, and Sichuan Provinces to survey and study counties that have better resources and conditions to develop small hydroelectric power quickly, and to help draw up plans to realize electrification in 5 years. According to arrangements, representatives of these 100 test points will be called upon to participate in a meeting in the first quarter to study how to implement the plans for the pilot projects in stages.

Recently, a leading comrade of the Central Committee inspected Sichuan and Fujian and proposed the development of Chinese-style electrification. He said, "China's hydraulic resources are abundant, a great advantage the development of small hydroelectric power stations. They can be greatly developed to let electric power serve the farmers. After the rural villages have many small hydroelectric power stations, they can use electricity for cooking, lighting, heating, and television, and for showing movies. Cultural life can become active, and electricity can also be used to develop sidelines and processing agricultural products, and to develop commune and brigade enterprises. He suggested that we should first establish 100 pilot projects in counties to basically realize Chinese-style electrification in 5 years.

According to the important opinions of the leading comrades of the Central Committee, the party organ of the Ministry of Water Conservancy and Electric

Power has conducted many discussions and studies and believes that the electrification is very great. It is a strategic problem of an overall nature. Rural electrification of the standard of a middle class level is what the broad number of farmers in our nation has been dreaming and hoping for. It is a natural trend in rural economic development. It will bring about a great change in the entire economy of the society.

The Ministry of Water Conservancy and Electric Power believes that there are good conditions to develop Chinese-style electrification. China's hydraulic resources are abundant. They can provide for the development of 70,000,000 kilowatts of small-scale hydroelectric power. Recently, the Ministry of Water Conservancy and Electric Power has tentatively selected 100 pilot project counties which have about 8 million kilowatts of exploitable hydroelectric resources. With only 17 percent developed, there are still more than 6 million kilowatts that await development. It can be seen that the potential is very great.

9296
CSO: 4013/154

POWER NETWORK

1983 TO BE BIG YEAR FOR NORTHEAST POWER GRID CONSTRUCTION

Shengyang LIAONING RIBAO in Chinese 3 Mar 83 p 1

[Article by Nian Qian [1819 o578] and Zheng Mao [2973 5399]: "Northeast Power Grid to Acquire 950,000 kW in 1983"]

[Text] Group leader Li Desheng [2621 1795 3932] of Northeast Power Grid announced in the February 26 working conference held by the Northeast Power Management Bureau that 1983 will be a big year for the northeast power grid in terms of construction investment: 950,000 kW of generator capacity will be added to the grid, which is 4.5 times the amount for 1982.

According to Li Desheng, it is not easy for the state to come up with such large investment in the electric power industry while the national economy is still experiencing some difficulty. From now on we must speed up the construction of power plants and accomplish the assignments made by the state. Each generator installed must be properly maintained to insure reliable production of power.

He pointed out that the mismatch today between the supply and demand of electric power is even more acute than before. The electric power industry should adjust to the new development situation, make a major effort of improvement to increase the economic efficiency and continue to work on the contract system.

A contract management responsibility system must be established to insure safety, problem solving, economy, profit, cost, efficiency and quality, the system must also shorten the maintenance cycle. If the maintenance cycle of a 200,000 kW generator can be reduced from 60 days to 50 days, it would produce an extra 50 million kWh of electricity. If the annual average utilization hours of all the coal power plants in the grid could be improved by 2.5 percent, the grid would produce an extra 1.3 billion kWh of electicity valued at 3 billion yuan.

9698
CSO: 4013/194

CAREFUL STUDIES PRECEDE SELECTION OF HIGH-VOLTAGE SWITCHES FOR PLATEAU REGIONS

Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 1, 5 Jan 83 pp 4-6

[Article by Wu Meichao [0702 5019 3390]

[Excerpts] Overview of High-Voltage Switches for Plateau Regions

In China's plateau regions, dozens of high-voltage (110, 220, and 330 kv) transmission lines and substantially more medium-voltage (10, 35 kv) lines have been installed. These transmission lines use two different types of high-voltage switches: ordinary switches with ample insulation; and high-voltage switches specially designed for plateau regions (of course, these switches can also be used in regions less than 1,000 meters elevation). The various types of high-voltage switches now being produced for plateau regions in China and their technical data are presented in Table 2.

The main feature of a high-voltage switch designed for plateau regions is its reinforced exterior insulation. The GN16-35G is an isolating switch designed for indoor use in regions 3,500 meters above sea level. The GW-145, and 245 switches are designed according to foreign standards and are primarily used for foreign aid purposes; they have reinforced insulation and can be used in plateau regions. The GW 7 series was developed to satisfy the high-elevation requirements for the 330 kv transmissions lines in the Liujiaxia and Tianshui regions.

The ZH1 series combination electrical equipment are devices connected to the output terminals of the three-pole, double-break GW 7 switches, including models GL, GJ, DGL, DGJ, DG, GDGL, LGDGL, GDG, GG, GGL ("G" denotes isolating switch, "L" denotes current mutual inductor, "J" denotes condenser type voltage mutual inductor, "D" denotes electric cable joints) etc.

The air circuit breaker and the less expensive limited oil circuit breaker designed for plateau regions both have reinforced exterior insulation.

Because of their superior arc-suppression and dielectric properties, the SF_6 gas, SF_6 circuit breakers have undergone rapid development in recent years and are widely used around the world. It has the following desirable features: reliable performance, advanced sealing technique, simple construction, easy operation, and long inspection cycle; it is also suitable for use in plateau regions.

In an attempt to greatly reduce power station floor space, a structurally compact, sealed combination equipment, the ZF1-110 SF_6, has been developed. This indoor assembly consists of circuit breakers, isolating switches, grounding switches, current mutual inductors, voltage mutual inductors, lightning protection devices, generating lines, high-voltage sleeves, and operating mechanism. Recent tests show that it can be used in regions 2,500 meters above sea level.

Selection of High-Voltage Switches for Plateau Regions

The United States, the Soviet Union, and other countries have made significant progress in high-elevation transmission and transformer technology by conducting large-scale experiments in artificially controlled climate conditions and in actual field environment. But these countries have only a limited number of lines through plateau regions, and most of them are around 2,000 meters above sea level. Furthermore, the standard voltage levels are quite dense in regions such as the United States, Europe, and Japan. Their high-voltage switches used for plateau regions may be just ordinary high-voltage switches rated at higher voltage levels. Consequently, there has been no information concerning high-voltage switches for plateau use in foreign literature.

China however, has large plateau regions at high elevations and there are wide separations between standard voltage levels. Therefore, a series of specially designed high-voltage switches had to be developed; also, scientific classification of elevation levels over plateau regions had to be carried out.

To accomplish these goals, the Kuming Electrical Equipment Research Institute and the Xian High-Voltage Electrical Equipment Research Institute have conducted extensive experimental research in laboratories with artificial climate control. They have also conducted tests and inspections in the field to provide data for selecting high-voltage switches used in plateau regions.

In the past, with the exception of a few lines and a limited number of specially designed equipment, most high-voltage switches used in plateau regions were simply ordinary high-voltage switches. Some of them were switches with ample insulation; some were switches with higher voltage ratings; and others were switches being used at the risk of degraded efficiency and reliability. With recent advances in production, major efforts have been made to build high-voltage switches for plateau regions, so that the users are provided with a number of selection options.

How should one select high-voltage switches for use in plateau regions? With regard to circuit breakers, a variety of different types have been used in practice, including oil, air, SF_6, etc. Currently, there is no simple rule for selecting a particular type. The selection is further complicated by the unique conditions of various plateau regions. We suggest that the selection of high-voltage switches for plateau regions should be based at least on the following considerations.

The first consideration is exterior insulation. An insulation correction factor corresponding to the elevation of the region should be computed. Calculations should also be carried out based on the rated elevation range and the test voltage value of the switches to see if they can operate at the location where they are to be installed.

The second consideration is the special weather conditions over the plateau region. For example, extreme temperature and humidity, wind load, earthquakes, large diurnal temperature difference, severe salt corrosion, high-frequency lightning, etc., should be carefully investigated to see if they are consistent with the design conditions of the equipment, or to decide which type of plateau switches should be selected.

There are other selection considerations. For example, in terms of cost, oil circuit breakers are less expensive than SF_6 circuit breakers; in terms of floor space, combination electrical equipment is preferred, as the GW 7 isolating switch has a short distance between the three phases and a longer distance in the longitudinal direction. In terms of maintenance requirements, the maintenance of SF_6 circuit breakers are greatly reduced, but more experience has been accumulated with oil circuit breakers. In addition, past experience and tradition in using the equipment should also be considered in the selection process.

In short, in selecting high-voltage switches for plateau regions, it is necessary to conduct a detailed study of the environmental conditions of the particular location, and to ensure that the design and technical specifications of the selected switches will meet the requirements. If the technical requirements cannot be met, then the user and the manufacturer should discuss the situation until a satisfactory compromise can be reached. This is the only way to ensure safe, reliable, and efficient operation of electric power systems.

Table 2.

Model Number	Name	Rated voltage (kilovolts)	Rated current (amps)	Applicable elevation (meters)	Main production plant
GN16-356	indoor isolating switch	35	630 & 1250	3500	Xi'an high-voltage switch plant
GW4-145	outdoor isolating switch	110	1000	3000	
GW4-245		220	1000	1900	
GW7-220		220	1200	1700	Xi'an, Shenyang, Pingdingshan high-voltage switch plants; Beijing Switch Plant
GW7-330		330	1500	2000	
ZH1-220	open-type combination electrical equipment	220	1200	1700	Xi'an, Shenyang
ZH1-330		330	1000 & 1500	2000	
KW6-35	outdoor air-blast circuit breakers	35	2000	2000	Xi'an
KW4-110		110	1500	1700	
KW5-110				2000	Shenyang
KW4-220		220	1500	1700	Xi'an
KW5-220				2000	Shenyang
KW4-330		330	1500	1700	Xi'an
KW5-330					Shenyang
SW6-110	outdoor low-oil-content circuit breakers	110	1500	2000	Xi'an, Shenyang Beijing
SW6-220		220			
SW6-330		330			
LW1-220	outdoor SF6 circuit breaker	220	2000 & 3150	2000	Xi'an
ZF1-110	indoor sealed combination electrical equipment	110	1000	2000	

3012
CSO: 4013/123

POWER NETWORK

SHANXI POWER INDUSTRY EXPANSION PLANS STUDIED

Taiyuan SHANXI RIBAO in CHinese 4 Apr 83 p 1

[Article by Zhu Ping [4376 1627], Zhang Shouxin [1728 1343 0207] and Hou Xiangchu [0186 3276 2806]: "Shanxi Power Industry Expansion Plan Discussed"]

[Text] From 21-26 March a meeting was held in Taiyuan to discuss the expansion plan of Shanxi's power industry. The central task of this meeting was to conduct scientific discussion of four tentative plans: The Shanxi Electric Power Industry Expansion Plan," "The Shanxi Electric Power Distribution Plan," "The Shanxi Power Grid Plan," and "The Shanxi Rural Electrification Plan."

Representatives from the Electric Power Institute of the Ministry of Water Conservancy and Electric Power and the Taiyuan Engineering College presented six papers in the meeting, including "A Tentative Plan for Exporting Coal-fired Electric Power from Shanxi," and "Economic Efficiency Analysis of Investments in Shanxi's Electric Power Industry." Twenty experts and scholars gave talks in the meeting. The major points brought up included the effective use of coal-fired power plants in Yantong, and central and southeastern Shanxi; supplying electric power to certain cities in northern, eastern, northeastern, and south-central China to reduce the pressure of shipping large quantities of coal out of Shanxi and to alleviate the serious power shortages in Beijing, Tiajin, and other cities and provinces; the need to pay attention to hydroelectric power while developing coal-fired electric power; building appropriate small hydroelectric and coal-fired power plants while constructing large power plants; the construction of ultrahigh-voltage transmission lines for exporting electric power to other provinces, and complete and automated modern power grids; speeding up rural electrification; developing urban heating plants and combining the production of heat and electric power. The consumption of coal and electric power in industrial and agricultural production in Shanxi is the most backward in China and abroad, and special attention should be given to the conservation of coal, electricity, and water. High priority should be given to environmental protection in the construction of coal-fired power plants and a major effort should be made to upgrade training, education, and research in order to develop and train qualified personnel.

The Shanxi Power Industry Expansion Meeting was sponsored by the Shanxi Electric Power Bureau and the Shanxi Electrical Engineering Society; 230 specialists and scholars attended the meeting and deputy governors Guo Qinan [6753 2953 1344] and Jia Chongzhi [6328 0394 0037] addressed the meeting.

9698
CSO: 4013/194

BRIEFS

SHANXI AUTOMATIC TRANSFORMER STATION--An unmanned automatic transformer station using China's newest design--the Qinxian substation on the southern outskirts of Taiyuan--has recently been completed and is expected to start operation at the end of March. The first construction phase of the substation was a 50,000 kVA automatic load voltage regulated transformer. The communications portion employs state-of-the-art fiber optics technology and is capable of remote control, sensing, and communication; the audio signal is precise and immune to electromagnetic interference. It is the first such transformer station in Shanxi. All the electrical components were installed by the Shanxi electrical construction and components bureau. Once this substation comes on line, it will change the electric power supply in the southern suburb of Taiyuan where circuits are overloaded and blackouts occur several times a week. It will not only provide for normal use of electricity for production and households in the area, but will also balance the electricity supply of the entire Taiyuan region. [Text] [Taiyuan SHANXI RIBAO in Chinese 23 Mar 83 p 1] 9698

CSO: 4013/194

HYDROPOWER

WU JIANG RIVER VALLEY DEVELOPMENT PLAN OUTLINED

Guiyang GUIZHOU HUABAO in Chinese No 1, 1983 pp 25-27

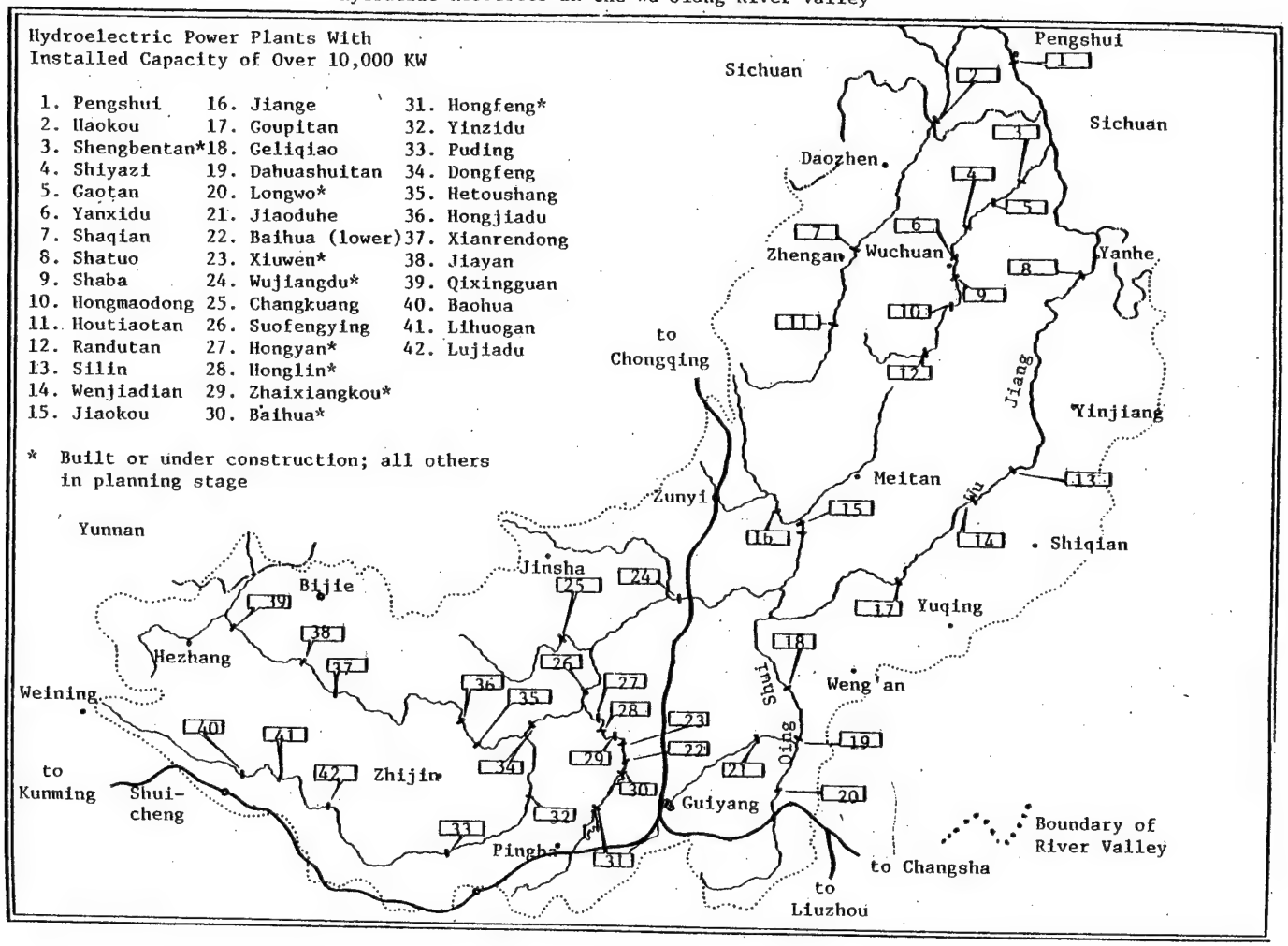
[Article: "The Wu Jiang: One of China's Ten Major Hydroelectric Power Bases"]

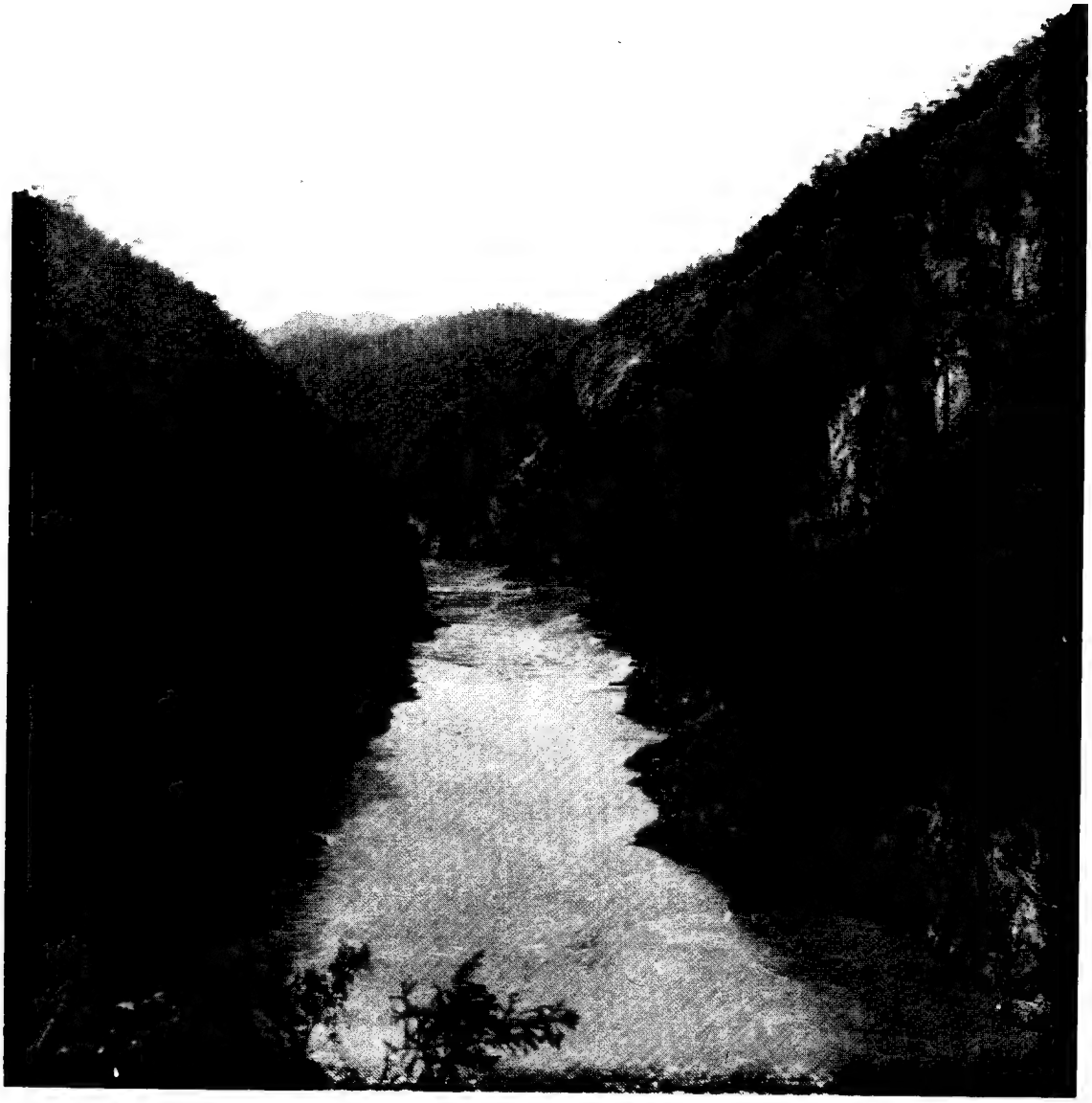
[Summary] "In compliance with the requirements laid down by the 12th Party Congress to quadruple industrial and agricultural output value this century, state hydropower organs are marshaling forces to construct 10 huge national hydroelectric power bases. The Wu Jiang in Guizhou Province is No 6 on this list."

Conditions for development are excellent: The drop of the river is great and abrupt, the peak load center is nearby and relatively few people will have to be displaced. Flowing through the central portion of the province, the Wu Jiang has a total length of 1,036 kilometers, a drop of 2,123.5 meters, and a theoretical hydroelectric reserve of 10.426 million kilowatts, or 56 percent of the province's total reserve.

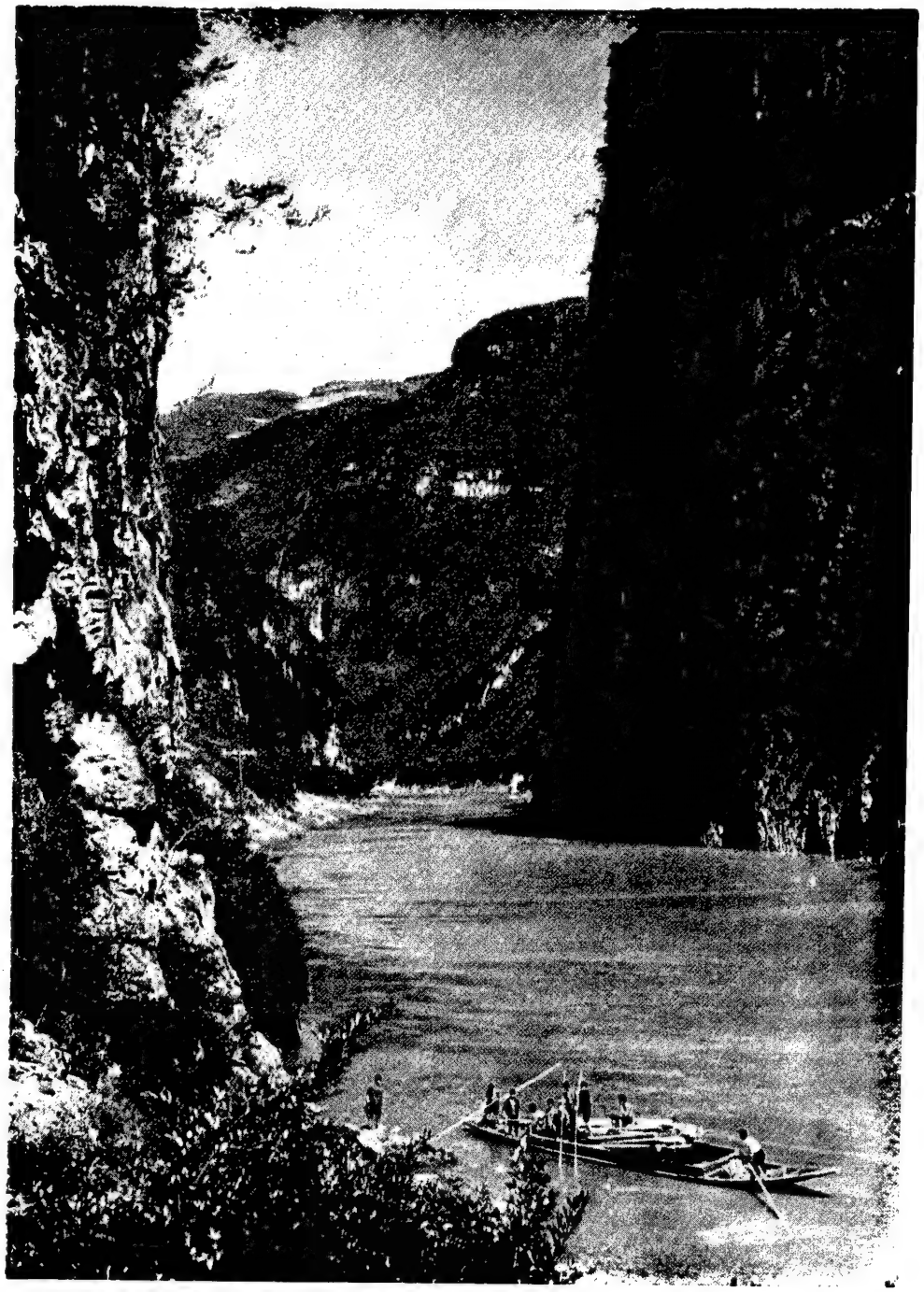
In order to accelerate the development of the hydraulic resources of the Wu Jiang River Valley, the Guizhou Provincial People's Government held a leadership conference to plan and organize its development, creating the Wu Jiang River Valley Development Plan Leading Team. Its task is to work up guidelines for comprehensive economic development centered around the generation of electric power but including also power transmission, irrigation, aquatic products and flood control. Among the eight cascade power stations to be built on the mainstream of the Wu Jiang are the Wujiadu Power Station (installed capacity: 630,000 kilowatts), the Dongfeng Power Station (installed capacity: 400,000 kilowatts), and the Goupitan Power Station (installed capacity: 2 million kilowatts). Preparatory work and initial construction on Dongfeng is to be done during the end of the Sixth Five-Year Plan and the beginning of the Seventh Five-Year Plan. Survey work on Goupitan has already started.

Hydraulic Resources in the Wu Jiang River Valley





Goupitan on the Wu Jiang, in Yuqing County



The dam site for the Dongfeng Hydroelectric Power Station on the Yachi He.

CSO: 4013/215

HYDROPOWER

FEASIBILITY STUDY SHOWS NO MAJOR OBSTACLES IN WAY OF HUGE ERTAN PROJECT

Chengdu SICHUAN RIBAO in Chinese 7 May 83 p 1

[Article: "Feasibility Study Identifies Major Geological Problems, Demonstrates That Conditions Are Excellent"]

[Text] The Ertain Hydroelectric Power Station, a giant comprehensive key hydroelectric project planned for development in the near future, has now undergoine more than a decade of surveying, designing, and testing. The major geological problems have for the most part been ascertained and the excellent conditions will make it possible to build a world-class high dam. On the eve of "1 May", at the behest of the State Planning Commission, the Ministry of Water Conservancy and Electric Power invited close to 100 hydroelectric power experts to Dukou for a feasibility study report conference to discuss every aspect of the technical problems associated with the project.

The Ertan Hydroelectric Power Station (site] is located on the lower course of the Yalong Jiang, a major tributary of the Jensha Jiang in western Sichuan. Here, the mountains on both banks of the river are steep, the river valley itself is deep and narrow with many shoals and rapids--a natural spot for the construction of a huge hydroelectric power station, Since 1972, engineering technical personnel and workers of the Chengdu Surveying and Design Institute and Unit 00300 have been engaged in the early phase work on this hydroelectric project. In order to put together a rational and economical plan for the state, many experts and survey and design personnel have scaled mountains and forded streams, stepping off the entire circumference of the 7000-square-kilometer region until finally, in 1982, they had completed the "Feasibility Study Report on the Yalong Jiang Ertan Hydroelectric Power Station," as well as a dozen or so monographic reports on a full range of topics.

Analyses of the mass of surveys, plans, and tests show numerous advantages in building a large-scale hydroelectric power key project at Ertan: The geological conditions and regional stability are very good; there are no major faults running through the dam site; the reservoir has a long mainstream and a large surface area; the solid rock formations at the dam site are suitable for the foundations of a high dam; the rock formations on the left bank are ideal for the construction of an underground power house; and gravel for the concrete is abundant and transportation is convenient. In addition,

the loss from flooding will not be extensive as it has been for some other large-scale hydropower stations built in China. The feasibility study shows that Ertan has the conditions to build a dam 245 meters high that will form a reservoir capable of storing some 5.8 billion cubic meters of water, and a mammoth hydroelectric power station with an installed capacity of 3000 megawatts that will produce 16.5 billion kilowatt-hours of electricity a year. After the hydroelectirc station has been built, it will have a major impact on easing the power shortage problem in Sichuan Province and provide a big boost to the economy of the southwest region.

The Ertan Hydroelectric Power Station's main function is to generate electricity, but it will also facilitate the passage of logs, navigation, industry, water for daily living, fish breeding, and other comprehensive uses.

CSO: 4013/233

WORK TO BEGIN SOON ON BIG TONGJIEZI HYDROPOWER STATION

Chengdu SICHUAN RIBAO in Chinese 30 Mar 83 p 1

[Article by Huang Yongsheng [7806 3057 4141]]

[Text] Plans for another riverbed-type large-scale water conservancy key project--the Tongjiezi Hydropower Station--have been finalized. Revised preliminary design and overall engineering estimates have been approved. Currently it has entered the phase of project preparation, and full-scale construction work is about to begin.

The 600,000-kW Tongjiezi power station is located within the city limits of Dongshan; it is one of the cascade power stations located at the end of the Dadu river system, which is more than 30 km from the already built Gongzui power station. In september and November of last year, during the "Wu Ding" conference sponsored by the Water Conservancy and Hydropower Development Company, a critical review of the revised preliminary design, the project technical organization, and the overall engineering estimates of the Tongjiezi project was conducted. The Ministry of Water Conservancy and Electric Power has approved the plan and agreed on a construction period of 11 years; the power station is expected to begin operations in 1991, and the entire project will be completed by 1993. The power station will have four generators each with an installed capacity of 150,000 kw, and the annual output will be 3.2 billion kilowatt-hours, which is equivalent to 20 percent of the current total output of Sichuan Province. Upon completion, this station will operate in conjunction with the Gongzui power station and will serve power regulation. The Tongjiezi power station is a key hydropower project which will not only provide power generation, but also serve water regulation, irrigation, and improvement of river conditions. This power station was surveyed and designed by the Chengdu Survey and Design Institute. The construction work will be carried out by crew members of the No 7 Engineering Bureau of the Ministry of Water Conservancy and Electric Power, who, after completing the Gongzui power station at the end of 1978, have been transferred to the new construction site. Currently there are over 9,300 people working at the site. Permanent and semi-permanent housing and temporary work tents have been erected. Also, full-scale efforts are underway to put in a power supply, communications facilities, and roads, and to clear the surrounding land. The completion of this power station will greatly enhance industrial and agricultural production in the southwestern region, and stimulate the modernization of national defense and science.

3012
CSO: 4013/186

GUIZHOU'S MAOTIAO HE CASCADE HYDROPOWER PROJECTS BRING ECONOMIC BENEFIT TO REGION

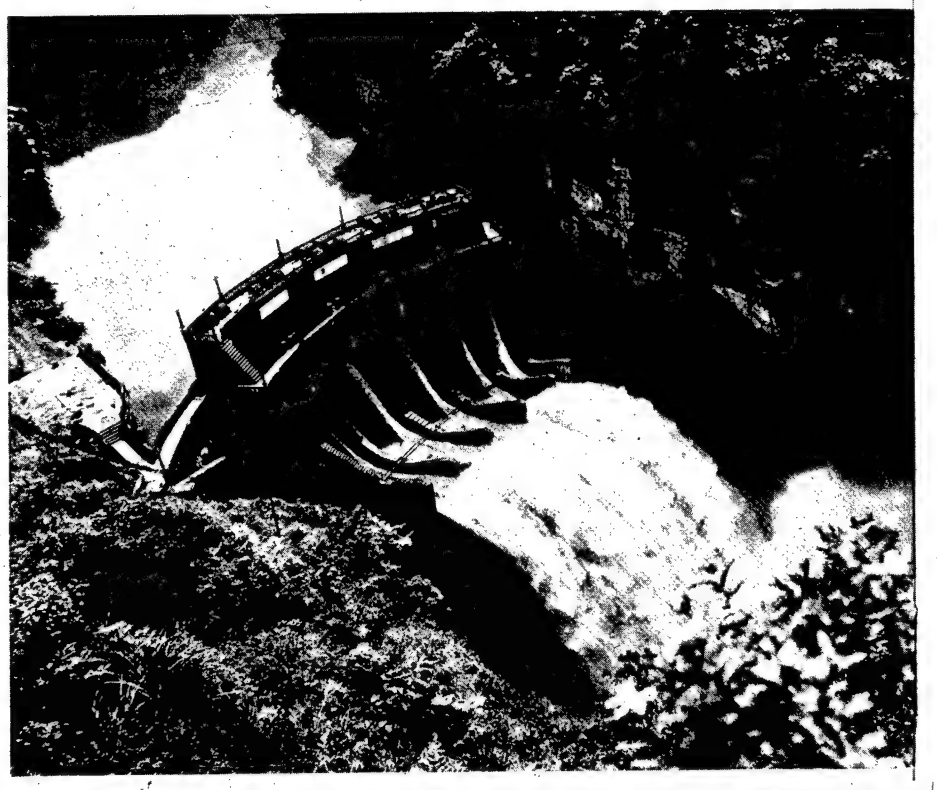
Beijing ZHONGGUO [CHINA PICTORIAL] in Chinese No 4, Apr 83 pp 8-9

[Article: "The Maotiao He Cascade Hydropower Stations"]

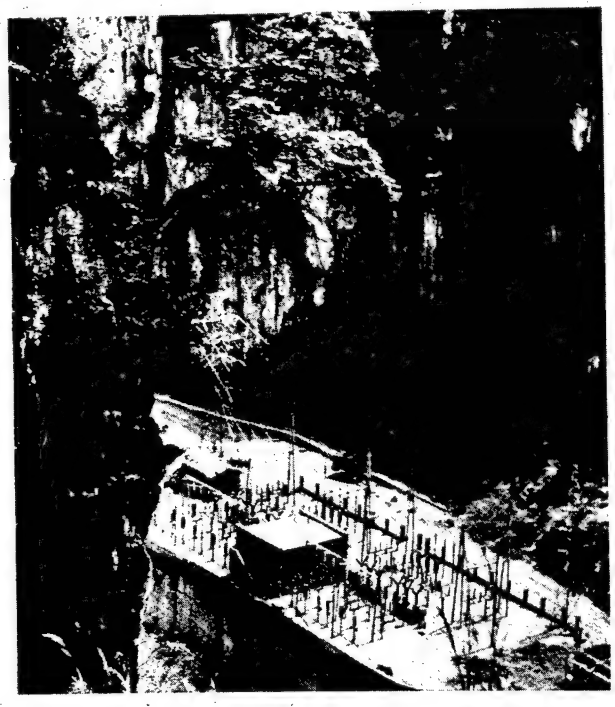
[Text] Flowing through remote mountains and secluded valleys of Guizhou's central highlands, the Maotiao He is a southern tributary of the Wu Jiang, itself a part of the Chang Jiang river system. The Maotiao He has a total length of 180 kilometers and a fall of 550 meters. It is a rich source of hydraulic energy.

At the end of the 1950's, hydroelectric power departments began to survey and develop the Maotiao He. Today, six cascade hydropower stations with six different dam designs have been constructed. The total installed capacity is 239,000 kilowatts. Most of the river valley of the Maotiao He consists of carbonate strata through which the river has created numerous fantastic subterranian caverns and underground rivers. These complex geological conditions created many problems in dam design and engineering. But through painstaking surveys of the topography, hydrology and geological features of the river valley, hydropower construction personnel ultimately selected the proper dam sites and designed dams of new types and structures such as rock-fill dams, gravity dams and double-arch dams. Taking steps to prevent seepage and selecting stable dam foundations, they have attained their predetermined goals.

The electric power generated by the Maotiao He cascade hydropower stations is fed into the Guizhou grid for unified transfer. With the development of the Maotiao He, the region has seen the construction of the nation's largest electrolytic aluminum plant and the area's rich deposits of coal, phosphates, aluminum, and iron are now being exploited and used.



The Third Cascade Xiuwen Hydropower Station. The power house is located below the dam. The spillways are located on the crest of the dam.



The switching yard of the Fifth Cascade Honglin Hydropower Station.

The First Cascade Hongfeng Hydropower Station of the Maotiao He cascade power stations (lower portion of photograph) and the Hongfeng Hu Reservoir.

CSO: 4013/200

HYDROPOWER

1982 SAW NEW PROGRESS IN SMALL-SCALE HYDROPOWER CONSTRUCTION

Beijing SHUILI SHUIDIAN JISHU [WATER RESOURCES AND HYDROPOWER ENGINEERING] in Chinese No 2, 20 Feb 83 p 1

[Text] In 1982, as a result of implementing the guideline of "self-construction, self-management, and self-utilization," and the policy of "using electricity to promote electricity," new progress was made in the development of small-scale hydropower. According to preliminary estimates, by the end of 1982, more than 1,400 new small-scale hydropower stations had been completed and put into production, adding 440,000 kW of generating capacity; the total generating capacity has now reached 8 million kW. Through improved management and seasonal utilization of electric power, the total output of small-scale hydropower in 1982 reached 16.3 billion kilowatt-hours, a 13 percent increase over the previous year, equivalent to saving over 6 million tons of standard coal.

In Guangdong Province, local communities and farmers were mobilized by the "self-construction, self-management, and self utilization" guideline and the policy of "using electricity to promote electricity," and completed 313 new small-scale hydropower stations in 1982. The increased generating capacity was 100,000 kW, which accounted for 23 percent of the new generating capacity of the country; its annual output was 2.6 billion kilowatt-hours, which ranked first in the country. At present, the generating capacity of small-scale hydropower in Guangdong Province has reached 1.22 million kW making it the first province in China to achieve more than 1 million kW of installed capacity. In addition, other achievements were reported during 1982: Sichuan Province increased its generating capacity by 60,000 kW to a total capacity of 850,000 kW; Hunan Province increased its generating capacity by 60,000 kW to a total capacity of 800,000 kW; progress was also made in the remote provinces (regions). For example, 39 new small-scale hydropower stations began operation on the Xizang Plateau.

In 1982, pilot projects were established in several southern provinces to take advantage of the surplus electric power generated by small-scale hydropower stations during high-water seasons. As a result, significant increases in small-scale hydropower output were achieved. For example, a 24 percent increase was reported in Sichuan Province, 18 percent in Fujian Province, and 15 percent in Hunan Province. Other provinces which had more than 10 percent increases in annual output included Guangdong, Guangxi, Jiangxi,

and Xinjiang. Increases were also reported in Hubei and Hebei provinces due to improved management and efficient utilization of electric power during the high-water season. Thanks to the support provided by the power supply organs, Beijing increased its small-scale hydropower output by 31 percent over the previous year. The Xizang Autonomous Region had an increase of only 7,088 kW in generating capacity, but its power output increased by 95 million kilowatt-hours, which represented a 68 percent growth over the previous year--the largest increase of all provinces in the country.

3012
CSO: 4013/210

HYDROPOWER

SMALL-SCALE HYDROPOWER STRATEGY: MORE LOCAL INVOLVEMENT, LESS STATE AID

Beijing SHUILI SHUIDIAN JISHU [WATER RESOURCES AND HYDROPOWER ENGINEERING] in Chinese No 2, 20 Feb 83 p 1

[Text] On 27 December 1982, reporters of "CHINA ELECTRIC POWER NEWS" interviewed Deputy Minister of Water Conservancy and Electric Power Li Peng [2621 7720]. On the issues of the Central Committee's policy on small-scale hydropower and the future plans of the Ministry of Water Conservancy and Electric Power, he made the following comments:

The authorities are very concerned about the problem of rural use of electricity. While inspecting small-scale hydroelectric projects, government officials indicated that developing small-scale hydropower is a strategic measure to provide energy resources, to encourage material and cultural development in the countryside, and to protect forests. They also established the guideline of "self-construction, self-management, and self-utilization." Self-construction means that development of electric utilities will depend on local funds and labor rather than on the central government; the latter will only provide the appropriate assistance and support. Self-management means that local communities will maintain ownership of the small-scale hydropower facilities they developed; they will manage the facilities, set the price of electricity, and designate their own power supply districts. Self-utilization means that the electricity generated by the small-scale hydropower stations will be used primarily for developing farm production and improving the peasants' standard of living. It is not intended to be sold to the national electric network for profit. However, qualified small-scale stations can arrange sales contracts with large electric networks if it is mutually agreed that such arrangements are to the benefit of both parties. In general, small-scale hydropower stations are rather inflexible and highly seasonal. During the high water season, favorable pricing policies should be adopted to encourage the use of electricity for cooking, heating water, and the development of light industries which make large demand on electricity. In order to support the development of small-scale hydropower, the ministry and the Sichuan Provincial Government have jointly established certain ground rules for developing small-scale hydropower in Sichuan. Upon completion of this trial program, other regions may initiate similar programs on their own. Furthermore, there are plans to select 100 counties with rich hydropower resources and good foundation in small-scale hydropower development as pilot projects for achieving the goal of Chinese-style rural electrification. The ministry is currently holding discussions with the provinces to determine a list of pilot projects, and is scheduled to have a planning meeting involving these 100 counties during the first half of this year.

3012
CSO: 4013/210

PROBLEMS IN DEVELOPMENT OF SMALL-SCALE HYDROPOWER ANALYZED

Beijing NENG YUAN [JOURNAL OF ENERGY] in Chinese, No 6, 25 Dec 82 pp 5-8

[Article by Wang Junchen [3769 0193 5256]]

[Text] In recent years, localities throughout the nation have built some small-scale hydroelectric power plants (throughout the nation, the installed capacity of the 85,000 stations has reached 7,570,000 kilowatts) to solve the problem of rural electric power by using local funds or funds collected from farmers and supplemented by state subsidies. The problem of electric power for the localities has been solved either in whole or in part, and the development of local industry and agriculture has been promoted. This is indeed a good way to solve the shortage of electric power in the localities.

But the construction of small hydroelectric power stations has lacked uniform consideration, overall planning, and rational distribution and as a result, problems have emerged in some regions. For example, at some places, the installed capacity has surpassed the maximum load and the electric power generated could not be consumed locally. It has to be transmitted out but power transmission and transformation equipment are not complete. Electricity is available but cannot be transmitted, and the installed generators cannot develop their potential. There are too many runoff power stations and there is too much electricity during the season of abundant water. In some regions, in order to generate income for every power stations, they operate in rotation. The generators still cannot fully develop their function. During the dry season, there is no water for the generators, and no matter how many generators are installed, the shortage of electricity is still very serious, and this affects industrial and agricultural production. There is a lot of seasonal electricity, but the regulatory capacity of the power network is insufficient, and this has caused large and small hydroelectric power stations to increase the amount of water abandoned. Some localities have ordered large and small hydroelectric power stations to abandon water proportionally in order that all large and small hydroelectric power stations could generate electricity, but the generators still could not fully develop their function. In operation, uniform dispatching has not been conscientiously carried out. During the season of abundant water, everyone rushed to generate working power. During the dry season, everyone rushed to generate no work power,

causing the quality of voltage over the power network to drop, and threatening the safety of the equipment that generates, supplies and uses electricity. Also, the manufacturing quality of some equipment is poor, the standard of installation and operation is low, and they affect the operation and development of small hydroelectric power stations. The emergence of these problems is mainly due to a lack of unified planning and rational distribution, and to placing emphasis on local benefits while neglecting the overall benefits of the state.

At present, our nation has a shortage in the supply of energy. In particular, the conflict between supply and demand for electricity is more outstanding. Electric power is insufficient. This is one of the major obstacles to hastening the buildup of industry and agriculture. There are many problems that need to be studied and discussed when considering how can we solve the problem of finding sources for rural electric power and of utilizing local small hydraulic resources better and fully.

I. The Buildup of Electric Power Must Be Uniformly Planned and Operated

The socialist economy is a planned economy developed according to plan and proportionally. It requires us to start out from the entire benefit of the state before we can realize the greatest national economic benefit. It is especially so in electric power which is a highly modernized industry. The generation, supply and consumption of electricity are completed simultaneously. It cannot be stored. This characteristic has demonstrated the necessity to centralize and unify the production and buildup of the electric power industry. The problems described above have emerged because this objective pattern has been violated. The problems exist now, and the only way is to better summarize the past, learn the lessons to avoid the recurrence of such similar problems in the future so that small hydroelectric power can better develop forward. If we do not have a unified plan, if each locality emphasizes local benefits, builds small hydroelectric power stations just to sell electricity, and builds large numbers of runoff power stations that require little investment, the power network will not be able to take in seasonal electric power, and by necessity, there will be more useless electricity during the season of abundant water while there will be more serious shortages of electricity during the dry season. Industrial and agricultural production will be affected, investment in the buildup of electric power will increase, the percentage of utilization of large and small electric power stations will not be high, and the benefits of the state and the collective will be affected.

The electric power stations that have joined in the power networks can fully develop their economic benefit by relying on the superiority of joint operation with the large power network. The characteristic of the electric power industry has already shown that we must gradually join the power stations together to form large joint regional and even national power networks (abroad, many international power grids have already been built). A region may have several dozen small hydroelectric power stations. Although some are not linked together by water systems, but when they are joined into one united power grid, there will be many problems that are worth studying.

Which power station should be built first, which power station should be built later, where should investment first be placed, the economic results will be different. Where should the electricity be sent after completion of the stations, when should it be transmitted. The problems of comprehensive utilization of water conservancy, the benefits to the upper and lower reaches, the loss in flooding, etc. are all comprehensive economic problems that cannot be solve by one locality alone. These problems all have to be studied in depth and be technically and economically proven. The regional collectives have the money and can implement the method of giving bonuses for investment. The state can utilize these funds to first build those small hydroelectric power stations that can realize the highest economic benefits according to the growth of the load of electric power consumption, and only in this way can the function of the funds be fully developed.

Starting out from the whole benefit of the state and considering comprehensive economic benefits are the economic principles that should be followed in building up a socialist economy. Now in one region and on the same river system, different units that will realize benefits from the development of electric power are building small hydroelectric power stations and power equipment planned by themselves and interfering each other. Some projects have even affected the electric power construction projects with higher benefits.

II. Hydraulic Energy Should be Fully Utilized in Regions With Abundant Hydraulic Resources

To satisfy the load of electricity consumption, we must guarantee safety and quality. We must use the minimum installed capacity. The cost of fuel and operation should be the lowest. Runoff electric power stations generate electricity when there is water and shut down the generators when there is no water. Only their seasonal electric power can be used. They do not have a capacity to supply power for the entire year. During the dry seasons, we must install additional thermal power generators to guarantee power supply.

For example, a certain county has a small local power grid. It has a small runoff hydroelectric power station with a capacity of 4,500 kilowatts. From May to October, its maximum load is 1,800 kilowatts supplying 7,100,000 kilowatt-hours of electricity, and the annual number of hours of utilization is only 1,518. During the dry season, the maximum load is 1,400 to 1,500 kilowatts, and a small thermoelectric power station of 1,900 kilowatts has also been installed to supply 6,300,000 kilowatt-hours of electricity. The annual number of hours of utilization is 3,316. The total installed capacity of this small power grid is 6,400 kilowatts, 3.6 times the maximum load (at present, the power source of small power grids in regions with abundant hydraulic power is generally 2 to 3 times the maximum load). The use of capital in this way is worth studying during this period of large scale economic buildup by the state.

This small power grid does not have a heat load. The small thermoelectric power station consumes a lot of coal (2 to 3 times higher than the amount consumed by large thermoelectric power stations). Coal is supplied over a long distance, the price of coal and the shipping cost are both very high. Under this situation, we should fully utilize local hydraulic resources and not build thermoelectric power stations. If we build a hydroelectric power station of 5,000 kilowatts with a capability to regulate a reservoir (during the dry season, the guaranteed output is over 30 percent), the installed capacity will be 1,400 kilowatts less than the original power supply plan. Some 10,000 tons of coal can be conserved a year, and 300,000 to 500,000 yuan in coal prices and shipping cost can be saved.

The following table gives a rough estimate based on the loads described above to show which type of power station has a higher economic result in supplying power.

It can be seen from the table that less investment is required to build small runoff hydroelectric power stations without regulatory functions and small thermoelectric power stations but during the dry season, the power supply mainly relies on small thermoelectric power stations, the consumption of coal is high and the annual cost of operation is high. At the present price of electricity sold in the nation, the profits from small hydroelectric power stations are used to subsidize small thermoelectric power stations. The time for recovering the investment in the power stations (combined hydroelectric and thermoelectric power stations) is longer. The number of years for recovering the investment in small hydroelectric power stations with a reservoir regulation capability and for recovering the investment in medium sized thermoelectric power stations with high voltage lines to supply electricity is about the same. Although less investment is required for medium sized thermoelectric power stations and high voltage power transmission lines, the annual cost of operation is high, and in the long-range view, we should still build small hydroelectric power stations with a regulatory function, and it would be better to fully utilize local small hydraulic resources. This example shows that the economic results of building medium sized hydroelectric power stations with regulatory capabilities are the best, the annual cost of operation is low, and in these regions, we should first develop large and medium sized hydroelectric power stations (and actively develop those small hydroelectric power stations with a high economic benefit). In general, in regions with abundant hydraulic resources, we should mainly use hydroelectric power stations to supply electricity. The choice to build large and medium sized or small hydroelectric power stations should be technically and economically proven on an overall basis.

III. How Should the Benefits From the Joining of Large and Small Power Networks To Supply Electricity Be Distributed?

The property rights of large and small power networks are different. When supplying electricity by joining a network, individual economic benefits will be involved. At present, the following opinions have emerged in supplying electricity by joining a network, such as: the large power network

Comparison of the Economic Results of Power Supplied by the Various Types of Power Stations

Types of station	Method of reservoir regulation	Capacity of station (kw)	Investment in building station (10,000 yuan)	Annual output of electricity (10,000 Kwh)	Annual cost of supplying electricity (10,000 yuan)	Annual profit (10,000 yuan)	Recovery of investment (year)
Small hydro-electric power	runoff	4500	592.5	1340	84.3	9.5	62
Small thermo-electric power		1900			(65.3)	(28.3)	(20)
Small hydro-electric power	runoff	2300	372.5	1340	84.3	9.5	39
Small thermo-electric power		1900			(65.3)	(28.3)	(13)
Small hydro-electric power	annual regulation	5000	600	1340	40	53.6	11.2
Medium hydro-electric power	annual regulation	5000	600	1340	11	82.6	7.3
Medium thermoelectric power line of 35 kilovolts, 50 kilometers		2100	257.5	1570	69	24.6	10.5

Remark: 1. Figure in parenthesis indicates firing by local coal.

2. Calculated according to current national price for electricity.

3. The amount of power supply includes line loss on lines of power plants.

will not provide support, the price of procurement of electric power is low, the selling price of electric power is high; the acceptance of small hydroelectric power stations has caused the abandonment of large hydroelectric power stations, spending money and lossing electric power.... These opinions are all questions concerning the management and benefits of large and small power grids. How can these problems be solved? We should indeed study them well to benefit improvement of the economic nature of power grid operations.

In regions reached by large power networks, we must allow the percentage of utilization of small hydroelectric power stations to be high, and they must be linked with the large power network. But large and small power networks are two different beneficiary units. How can we distribute the economic benefits to the large and the small power networks? The following is an actual case used to explain this.

For example, a certain county's small power network has small hydroelectric power stations with an installed capacity of 15,000 kilowatts. During the dry season, it can guarantee an output of 3,500 kilowatts and it has joined the large power network in operation. This small power network generates 46,500,000 kilowatt-hours of electricity annually and uses 4,700,000 kilowatt-hours of electricity. The figures seem to be basically balanced. This phenomenon is an illusion making people believe that the small power network has realized self-sufficiency. But analysis of the characteristic that electricity cannot be stored shows that during the period of abundant water from April to September, the small hydroelectric power network has a surplus of electricity and it transmits 6,250,000 kilowatt-hours to the large power network. During the dry season from October to March the following year, the output of the small power network drops. It has a shortfall of 6,000 kilowatts of electric power and it requires the large power network to supply 6,750,000 kilowatt-hours. In this situation, the large power network has stored more than 6,000,000 kilowatt-hours of seasonal electricity for the small power network but this requires an investment in 6,000 kilowatts of installed capacity. This also increases the cost of generating electricity, and it increases the loss of the small power network in dispatching its seasonal electric power.

At present, the regions with abundant hydraulic resources in the southern part of our nation have built more than 80,000 small hydroelectric power stations of more than 6,000,000 kilowatts. Many small power grids have been formed, and gradually they will all have to join the large power networks. Most of them sell seasonal electric power to the large power networks during the season of abundant water, and during the dry season, they ask the large power networks to supply electricity to them. In the relationship between the price of electric power and mutual supply of electric power, some conflicts have developed. We can perform some calculations from the management viewpoint to see how these problems can be solved.

1. Small hydroelectric power networks selling electric power to large power networks

In the above example, the surplus 6,250,000 kilowatt-hours of electricity during the season of abundant water from April to September are sold to the large power networks. The large power networks are also in the season of abundant water, and therefore more water is abandoned to supply less electricity. In 1 year, profits decline by 200,000 to 300,000 yuan.

2. During the season of abundant water, small power networks supply surplus electricity to the large power networks, and during the dry season, the electricity is returned to the small electric power networks

To repay the debt by the large power network, investments for an additional installation of generators with a capacity of 6,000 kilowatts must be made. During the season of abundant water, the large power network accepted the electric power from the small power networks and abandoned more water, and realized a loss of 200,000 to 300,000 yuan in profits. During the dry season, the electricity is repaid in thermoelectricity, and this requires spending an additional more than 200,000 yuan for repayment. The two added together show a loss of 400,000 to 500,000 yuan for the large power network each year.

3. Large power network generating and supplying electric power for itself

During the season of abundant water and dry season, the large power network can generate more than 6,000,000 kilowatt-hours of additional electricity during each season, and in one year, 400,000 to 500,000 yuan of profits can be realized.

4. Small power network generating and supplying electric power for itself.

In 1 year, it can supply an additional 6,250,000 kilowatt-hours of electricity for itself and realize an additional profit of some 200,000 yuan.

5. The state can provide loans to build up electric power, the large and small power networks can be uniformly managed

According to the above example, the installed capacity of the small power network is 15,000 kilowatts. To guarantee electricity for the small hydroelectric power network, the large power network has to install a capacity of 6,000 kilowatts. The total installed capacity is 21,000 kilowatts.

Investment situation: The small electric power network with an installed capacity of 15,000 kilowatts requires an investment of 15,000,000 yuan (according to 1,000 yuan/1,000 kilowatts). The localities invest 11,250,000 yuan. The state invests 3,750,000 yuan (state subsidies are generally 1/3 to 1/4). To guarantee the supply of electricity for use by the small power network during the dry season, the large power network has to install 6,000 kilowatts in capacity at an investment of 4,500,000 yuan. The large power network dispatches 6,250,000 kilowatt-hours of seasonal electric power for the small power network and loses 200,000 to

300,000 yuan each year. Calculating over 8 years, this is equivalent to an investment of 2,000,000 yuan. The above amounts to a total investment of 10,250,000 yuan, basically equivalent to local investment. This shows that in joint network operations, the large power network must also make investments to guarantee the electric power used by the small power network. If they are uniformly managed, at least 5,000,000 to 6,000,000 yuan investment can be saved and 5,000 to 6,000 kilowatts less in installed capacity are required. Each year, more profits can be realized. The capital investment by the localities can be calculated at the interest rate for loans for economic buildup. Local investment amounts to 11,250,000 yuan, and an annual profit of about 1,000,000 yuan can be realized. This is equivalent to the annual profit realized by localities operating their own small power networks at present. In view of this, unified management is better.

IV. On the Question of the Annual Number of Hours of Utilization of Small Hydroelectric Power Stations

The annual number of hours of utilization is a major economic index to measure the degree of utilization of a power station. When the investment per unit kilowatt is the same the results of the power stations with a large annual number of hours of utilization are better. But, for power stations that have joined the power networks, their economic nature cannot be measured only by the number of hours of utilization of the stations themselves, we must also consider the problem of coordination between power stations, their function in the power network, and comprehensively consider their economic benefits. For example, there are two power stations with equal capacity and the same annual number of hours of utilization. One has a reservoir and is used for peak regulation during the dry seasons. This conserves more coal than using a thermoelectric power plant to regulate the peak. The other does not have a reservoir, and can only be shut down during the dry season. The power network, to guarantee power supply, still must invest and install additional generators and increase the investment in the power network. At present, the main problem in the power networks in regions where the proportion of hydroelectricity is large is the uneven supply of electricity between periods of abundant water and the dry seasons. We should mainly solve the problem of increasing the power source during the dry season. With the same annual number of hours of utilization, the function of power stations with a large number of hours of utilization is greater. Increasing the number of hours of utilization during the dry season will benefit the supply of electricity locally, the selling of electric power to the large power networks, the operation of the power network, regulation of the imbalance in the supply of electricity between the season of abundant water and the dry season, and economic benefits.

V. How To Solve the Problem of Imbalance in the Supply of Electricity Between the Season of Abundant Water and the Dry Season in the Power Networks That Have a Large Proportion of Hydroelectricity

I believe we should appropriately control the runoff power stations from joining in production. We should use more power stations with good regulatory function. The following aspects are concrete measures that can be considered:

(I) Increasing the Power Source During the Dry Season on the Basis of Building Up Power Sources

1. We should quickly construct reservoirs with a good regulatory function at appropriate localities in the upper reaches of river systems in combination with water servancy construction according to plans for the development of the river systems. During the season of abundant water, storing water should be the main task to increase the output of downstream power stations during the dry season.

2. We should build seasonal and daily regulatory reservoirs, increase the peak regulation capability during the dry season. At places that do not have conditions for building multiple-year and annual regulatory reservoirs, we can build seasonal and daily regulatory reservoirs. During the season of abundant water and during night time, we should store water and during the dry season and day time, we should generate electricity.

3. We should store energy by pumping. Many rivers have a flow throughout the year. We can also build some storage reservoirs and utilize low trough power of some power networks during the night (or small hydroelectric power stations) to pump water, store energy and generate electricity during the high peak periods.

4. In regions where the proportion of hydroelectricity is small (or regions not yet reached by large power networks), as long as we build small hydroelectric power stations to actually conserve coal and as long as the economic results are good, we should encourage the development of small hydroelectric power stations to fully utilize natural hydraulic resources.

5. Among industrial enterprises with favorable conditions, we should fully utilize heat energy, carry out comprehensive utilization of surplus heat, and establish facilities to use surplus heat and voltage differential to generate electricity.

(II). Adjusting the Time of Use of Electricity To Regulate Loads

1. We should change the habitual inspection and repair time of industrial production, carry out seasonal regulation of load, carry out production during the season of abundant water and carry out inspection and repair during the dry season.

2. We should develop seasonal industrial users. Enterprises that consume a lot of electricity per unit product, that has few workers, and that produce products whose cost includes a large portion for electricity, and enterprises with equipment that will not be damaged during the period when production stops, and enterprises whose products can be stored should increase their production to the maximum during the period of abundant water. Processing enterprises that can use electricity to substitute for oil and coal should use electricity during the period of abundant water (the price of electricity is correspondingly lower).

3. We should develop the use of electricity for processing agricultural sideline products, tea manufacturing, silk reeling must carry out processing during the period of abundant water. For example, Zhejiang produces about 1,000,000 dan of spring tea. Processing 1 dan requires over 400 jin of firewood. In every tea manufacturing season in this province, there is always a shortage of firewood and coal. If electricity can be used for processing, the resources can be obtained locally and this will greatly conserve coal and firewood.

4. We should develop the use of electricity for cooking during the period of abundant water. Regions with abundant hydraulic resources generally lack coal and firewood. Buying 1 dan of firewood requires 3 to 5 yuan. Buying 1 ton of coal requires 40 to 50 yuan. At present, the installed capacity of small hydroelectric power stations has a large surplus. During the rainy season, a lot of water is abandoned. If electricity can be provided for cooking 3 months out of every year, one household can conserve about 400 kilograms of coal. One restaurant and collective mess hall can conserve 10 to 15 tons of coal. Shipping 1 ton of Shanxi coal to Guangdong, Fujian and Jiangxi provinces costs more than 20 yuan. Developing electricity for cooking will conserve 8 to 10 yuan every 3 months per family per year in coal transportation cost. Each restaurant and collective mess hall can conserve 200 to 300 yuan. The state also can spend less in mining and subsidies. Using this money as funds for the added equipment needed to provide electricity for cooking is worth while.

(III) Readjusting the Prices of Electricity During the Season of Abundant Water and the Dry Season

In regions with abundant water, the source of electric power of small power networks is generally 2 to 3 times the load.

During the season of abundant water, a lot of water is unused. At current prices for electricity, people cannot afford to use electricity for cooking. If we lower the price during the period of abundant water to encourage utilization, generally the price should be similar to the price for civilian coal and firewood for cooking. With the current installed capacity of small hydroelectric power stations, it is estimated that each year, an additional 500 million to 600 million kilowatt-hours of electricity can be provided, equivalent to more than 400,000 tons of coal. In 1 year, the state can also collect an additional income of more than 20,000,000 yuan from electricity fees.

During the dry season, small hydroelectric power stations can join the power network to regulate the peaks. This will conserve coal consumed by thermoelectric power stations and the price of electricity should be appropriately increased. In general, the price of electricity generated during the season of abundant water and the dry season, during high peaks and low troughs, and the price of electricity for consumption should all be readjusted.

9296
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SICHUAN OVERHAULS MANAGEMENT OF SMALL-SCALE HYDROPOWER

Kunming YUNNAN RIBAO in Chinese 26 Jan 83 p 4

/Article: "Abolishing Limitations Unfavorable to Development: Reform of the Management System of Small Hydroelectric Power in Sichuan Is Welcomed"/

> /Text/ New China News Agency Editor's Note; Farmers urgently need to realize electrification. In the south and at other places where hydraulic resources are abundant, there are favorable conditions now to accelerate rural electrification. The main method is to develop hydropower, especially rural small-scale hydropower. To accelerate this development, we must reform the management system and readjust related policies. Sichuan Province encourages farmers to develop small-scale hydropower, to let farmers "build, manage, and use" hydropower by themselves. In handling the relationship between small-scale hydropower and the large power grids, it has considered the benefits of the central authority, the locality, the collective and the individual. This experience can be learned by all localities.

NCNA, Chengdu, 25 January--Sichuan Province, which has abundant water resources, is reforming the current management system for small-scale hydropower. It has abolished many limitations unfavorable to the development of small-scale hydroelectric power in order to mobilize the enthusiasm of the localities and the masses to develop electric power and stimulate the development of rural energy sources.

Sichuan Province has many rivers and practically every county has hydraulic and power generating resources. According to the general survey conducted by the water conservancy department, the exploitable hydraulic and power generating reserves of the whole province amount to 91 million kilowatts. Of this, exploitable small-scale hydroelectric power constitutes about 5.1 million kilowatts. But by the end of 1981, the installed capacity of small-scale hydroelectric power stations already built amounted to only some 860,000 kilowatts, constituting 17 percent of the exploitable amount. One of the reasons that small-scale hydroelectric power has not been developed and utilized to a great extent is that besides the insufficient understanding

of the role of small-scale hydroelectric power in solving the rural energy problem, various limitations unfavorable to the development of small-scale hydroelectric power in the management system and in policy still exist. For example, in the areas covered by the state's large power grids, even where there are hydraulic resources, local development of small-scale hydroelectricity is limited. Actually, large power grids cannot satisfy the needs of local consumption of electricity. Some counties, communes, and brigades have solicited private funds, invested labor to build small-scale hydroelectric power stations and they joined the large power grids. They only had the right to generate electricity but did not have the right to manage electricity and use electricity. The electric power was uniformly sold to the state's power departments. The electric power used had to be bought back from the power departments. They could not realize economic benefits. All of these limitations have hindered the enthusiasm of the localities and the masses to develop electricity.

In October of last year, the leading comrades of the Central Committee pointed out when they inspected Sichuan that small-scale hydroelectric power is an important source of energy. Sichuan Province should develop the superiority of its abundant hydraulic resources, and hasten the development of small-scale hydroelectric power. The Ministry of Water Conservancy and Electric Power and the Sichuan People's Government conducted many studies aimed at the problems existing in the management system of small-scale hydroelectric power, sought opinions from various sectors, and jointly established several regulations concerning actively developing Sichuan Province's small-scale hydroelectric power at the end of last year.

This document clearly states that to hasten the buildup of Sichuan's hydroelectric power, we must insist on the principle of simultaneously developing the large, medium and the small and combining state and local efforts to develop electric power. All localities with hydraulic resources can build small-scale hydroelectric power stations under a unified plan and arrangement. In developing small-scale hydroelectric power, the principle of mainly "building, managing, using" electric power locally must be followed and the policy of "using electric power to nurture electric power" must be carried out and the enthusiasm of each level to develop electric power must be mobilized. The establishment of small-scale hydroelectric power is mainly to provide electric power for the local areas to use and is mainly oriented towards the farm villages and the county towns. It must serve agriculture, local industries and people's lives to enliven local and rural economies and stimulate the development of rural electrification.

To currently handle the problem of joint operation between the small-scale hydroelectric power stations and the large power grids, the document states that the benefits of the central authority, the locality, the collective and the individual must be taken into consideration gether. After small-scale hydroelectric power stations join the large power grids, the ownership system, the subordinate relationship, and the financial relationship must not change. Some limitations on small-scale hydroelectric power exercised by the large power grids have been reformed. Prices and fees for electricity mutually supplied between large and small power networks have also been readjusted. During the period of abundant water and the dry period and during peak periods and low periods, small-scale hydroelectric power can

implement a floating price for electric power to encourage farmers to utilize cheap surplus electricity for cooking, boiling water and for processing agricultural sideline products and to realize "using electric power to nurture electric power." The document also stated that profits from the resale of electric power and profits from the generation and supply of small-scale hydroelectricity by enterprises belonging to the counties and below the county level, will not be included in the financial budget. They will all be used to develop local electric power.

These reform measures have been enthusiastically welcomed by the cadres in rural work at each level and the masses and enthusiastically supported by related departments. At present, they are conscientiously being implemented. Guanxian, which has built more small-scale hydroelectric power stations, calculated that after changing the past practice of "generating but not supplying" to "generating and supplying" by itself, the county could sell electricity to the farmers for living during the season of abundant water at a cheap price. In 1 year, electricity can replace firewood for 4 months. Some commune members in Rongjing County are also preparing to join together and gather funds to build small hydroelectric power stations.

9296
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THERMAL POWER

WORK ON JINZHOU POWER PLANT ACCELERATED ; LOCAL INDUSTRY PITCHES IN

No 2 Generator To Join Grid by End of Year

Shenyang LIAONING RIBAO in Chinese 3 May 83 p 1

[Summary] Work on one of the nation's major energy construction projects--the Jinzhou Power Plant--is now being accelerated. As of the end of April, installation of the 3,500-ton boiler had been completed and the steam turbine emplaced, 10 days to 2 weeks ahead of schedule. The No 2 unit will be joining the grid before the end of the year.

The Jinzhou Power Plant is a large-scale thermal power plant with a total installed capacity of 1.2 million kilowatts that will produce 8.5 billion kilowatt-hours of electricity a year. Upon completion, it will ease the tense power situation in the province and improve the quality of electricity in western Liaoning. The initial phase of the project began on 13 June 1979 and called for the installation of three generators, each with a capacity of 200,000 kilowatts. The first of these generators began to feed power into the grid at the end of December of last year [1982] and will produce 1.4 billion kilowatt-hours of electricity a year, or 40 percent of the electricity shortfall in the province.

The construction of this power plant has the all-out support of local party, government, military, and civilian elements. All of the involved organs of Jinzhou City, the Jinzhou Railway Bureau, and local military units have taken the construction of the power plant as something they are duty-bound to accomplish. The projects material needs are being filled as much as possible by the city's material departments and the railway organs make sure that transportation is available. If construction falters, the city's labor organizations pitch right in. To make transportation and communications easier, the city's passenger transport companies promptly make available long-distance vehicles to run between Jinzhou and the power plant. Military units stationed in the area have taken the initiative to handle the earthwork and nearby communes and brigades provide living accommodations for the construction crews. When work began on the No 2 generator this year, the project was faced with a critical shortage of equipment and materials. Units undertaking the construction had planned to complete the work by the middle of next year. But in order to meet the requirements of the four modernizations construction,

they decided to compress the work schedule, assure quality, and feed power into the grid before the end of the year. The relevant organs of Jinzhou City, along with the people building the power plant, jointly resolved the construction problems. With steel in criticially short supply, the city's metal companies have furnished more than 30 tons of all kinds of steel products. Building material companies have delivered 3,600 square meters of glass, half of the amount supplied to the entire Jinzhou region. For all parts manufactured in Jinzhou, all factories have put the needs of the power plant on a priority basis and have made arrangements to supply products ahead of time, even at considerable sacrifice to themselves. Not long ago, the plant needed a flash relay. That same evening, the Jinzhou Meter Component Plant, disassembled some of its own equipment to fill the power plant's request. Construction units are putting out even greater effort to have the No 2 generator on stream by the end of the year, dividing the project into campaigns: assembly of the low-pressure vessel, the boiler water pressure tests, the steam turbine cover assembly, the boiler acid bath, boiler ignition, and the start-up of the entire system. As of the end of April, the first two projects had been finished ahead of schedule.

Liaoning Industries Supply Materials, Equipment

Shenyang LIAONING RIBAO in Chinese 3 May 83 p 1

[Summary] On a priority basis, a number of Liaoning's industrial enterprises are, supplying materials and equipment for the Jinzhou Power Plant, a key state construction project. As of April, a quantity of materials and equipment had been delivered to the site for assembly and use, accelerating the pace of work on this large-scale key project.

These factories have put a priority on the material and equipment needed by key projects. Thirteen plants and factories, including the Shenyang Electric Cable Factory, the Shenyang Water Pump Factory, and the Shenyang Transformer Plant, have collectively organized their production capacities to supply some 138 kings of equipment to the Jinzhou Power Plant. The Shenyang High-pressure Valve Plant, the Shenyang Air Conditioning Equipment Plant, and the Shenyang Inductor Plant, after receiving their production assignments, pushed the 1983 2nd and 3rd quarter delivery schedules up to April. The Dalian Hoisting Machinery Plant fabricated a 75-ton overhead ganty crane to be used in the construction of the Jinzhou Power Plant. Originally scheduled for delivery in the 4th quarter, the crane was ready a full quarter early in order to assemble the No 2 generator and get it on steam ahead of time. By quickly replanning and reorganizing labor forces and with help from electric power organs, delivery was made in the 3d quarter, satisfying the requests of the construction units.

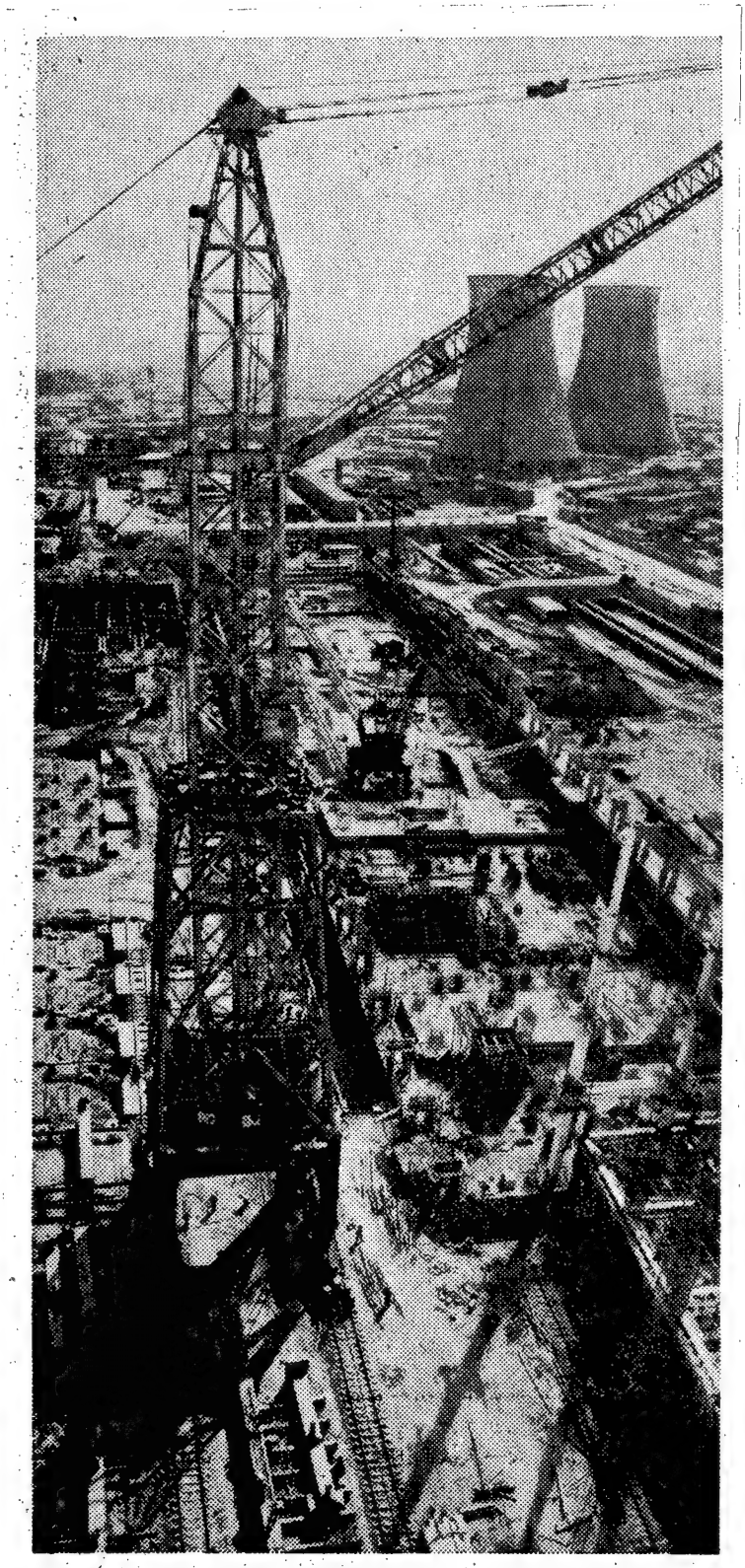
Enterprises such as Anshan Iron and Steel, Benxi Iron and Steel, Fushun Iron and Steel, and the Yingkou Medium Plate Plant are also supporting the construction of the Jinzhou Power Plant. They have put the production of steel materials going into construction of the plant on a priority basis in an all-out effort to get the No 2 generator operational at an early date this year.

CSO: 4013/235

THERMAL POWER

WORK INTENSIFIED ON THIRD STAGE OF SHENTOU PIT-MOUTH POWER PLANT

Taiyuan SHANXI RIBAO in Chinese 2 May 83 p 4



[Photograph and caption] Work on the third stage of the Shentou Power Plant has been intensified. When completed, it will have a total installed capacity of 1.35 million kilowatts--the largest pit-mouth power plant in the nation. More than 3000 personnel of the No. 2 Provincial Electric Power Construction Company are hard at work on the project.

CSO: 4013/229

BRIEFS

NEW SHANDONG CONSTRUCTION--The construction and expansion of five large and medium-sized thermal power plants in Shandong Province is in full swing. They are the Lunan, Longkou, Shiheng, Shiliquan and Huangtai thermal power plants. After completion of these plants, newly added installed capacity will reach 1.725 million kW. The No 5 125,000-kW generating unit of the Shiliquan thermal power plant and the No 1 100,000-kW generating unit of the Huangtai thermal power plant may be put into operation by the end of this year. [Jinan Shandong Provincial Service in Mandarin 2300 GMT 19 May 83 SK]

MAOMING OIL SHALE POWER PLANT--The provincial government recently approved a plan for building an oil shale power station at Maoming as an important means of taking full advantage of Maoming's oil shale resources to solve the province's power shortage. The generating capacity of oil shale is about 50 percent that of coal. Maoming has now built an oil shale opencast mine with an annual output of 5 million tons of oil shale. The planned installed generating capacity of the power station is 200,000 kW. [Guangzhou Guangdong Provincial Service in Mandarin 1000 GMT 14 Apr 83 HK]

NEW JILIN POWER PLANT--The State Planning Commission and the Ministry of Water Conservancy and Electric Power plan to build a large-scale thermal power plant in Changchun, Jilin Province. The power generating capacity of the power plant is four times more than that of all the power plants in Changchun. The design capacity of the plant is 400,000 kilowatts. After completion, the power plant will provide 2 billion kilowatt-hours of electricity annually. [SK300032 Changchun Jilin Provincial Service in Mandarin 2200 GMT 19 May 83 SK]

CSO: 4013/240

COAL MINISTER SAYS INDUSTRY SHOULD EASE CONSTRAINTS, ENCOURAGE FOREIGN INVESTMENT

Shanghai SHIJIE JINGJI DAOBAO in Chinese 21 Feb 83, p 2

/Article: "Gao Yangwen /7559 2254 2429/ Discusses the Future of the Development of China's Coal Industry"/

/Text/ Report by Beijing correspondents Lu Longwen /7120 7893 2429/ and Chi Tingxi /3069 1694 3588/: As spring begins, Minister of Coal Industry, Gao Yangwen /7559 2254 2429/, was interviewed by this paper's reporters in Beijing. In discussing the future development of China's coal industry, he said "China, which uses coal as its main source of energy, is different from Western nations that use petroleum as their main source of energy. This has been caused by two conditions: One is the historical setting. Historically, China has used coal as its main source of energy. Even in the 1960's, after the emergency of "Daging," this did not change. Of the one-time energy in the past, coal constituted over 90 percent. After Daging came into existence, the proportion of coal dropped to 70 percent but it still remained the main energy source. In 1975, Deng Xiaoping said China's energy must be mainly coal. It seems that this will not change in the next 20 to 30 years. Now, it seems that it was right not to have changed to relying mainly on petroleum. The second is the state of resources. China's coal resources are abundant and the distribution is very broad. Throughout the nation, 1,031 counties produce coal and the known reserves amount to 700 billion tons. Therefore, whether the coal industry develops quickly or slowly and whether it develops well or not will greatly influence the future of the four modernizations and the improvement of people's standard of living."

"Doubling To Guarantee Quadrupling"

The 12th Party Congress established the glorious strategic goal of quadrupling China's total production value in industry and agriculture by the end of this century. How much energy is needed for quadrupling? A rough estimate shows that one-time energy (coal, hydroelectricity, petroleum, and natural gas)) must double before quadrupling the total production value in industry and agriculture can be guaranteed. This includes energy conservation. Therefore, coal, as an important source of energy in our nation, must also double. The current slogan on the coal front is: "Doubling to guarantee quadrupling!" What is the concrete concept of doubling coal? In 1980, China produced 620

million tons of raw coal. Last year, it produced 644 million tons. It must produce over 1.2 billion tons by the end of this century. This is the quantitative goal. There is also a qualitative goal. This means the coal industry cannot be like the past anymore. It must change key coal mines that are backward and basically operated manually to coal mines that are modern and that are founded on science and technology, improve the level of mechanization, and realize safe production. It must change from producing mainly raw coal to producing varied products. It must process coal, select coal concentrate, carry out gasification, etc. to create conditions for conserving energy in society. It must also extensively overhaul systems and policies that cannot adapt to the requirements of the four modernizations. These are our goals.

How can we realize the above strategic goals? We must take the following measures:

The Building of New Mines Should Emphasize the Development of Large Open-Pit Mines

1. Opening up new ways. Where do we get 1.2 billion tons of coal? Generally there are 4 to 5 plans. Existing mines uniformly equipped by the state should increase their current annual output of 350 million tons to 400 million tons. Local mines (including small mines operated by the masses and collectives) should increase their current annual output of 300 million tons to 500 million tons. Third, we should obtain 400 million tons of coal from newly built mines. The building of new mines should emphasize the development of large open-pit mines. By that time, large open-pit mines should produce 200 million tons of coal, constituting one-half of the output of all the newly built mines. Five changes are required to open up new ways:

1) Change out-dated technological processes, out-dated technology, and out-dated equipment to new technological processes, new technology, and new equipment; 2) Change the incomplete control of occurrence of disastrous accidents to the use of scientific and technical means to fundamentally change the safety situation; 3) Change the production of mainly raw coal to elementary processing, deep processing, improving quality and producing many varieties; 4) Change from singular business to diversification, such as joint ventures in coal and electric power and coal and chemical industries, and production of building materials; and 5) Change the conditions of transportation. For example, build special railroad lines for the transport of coal, develop marine transportation and auxiliary pipeline transport, and link the production of coal with the use of coal. At present, special railroads for trains carrying 10,000 tons of cargo are being designed. Foreign concerns have been commissioned the design the transport pipeline fron Jungar in Nei Monggol to Qinhuangdao. The pipeline from Lu'an in Shanxi to Nantong in Jiangsu is being prepared. The transport pipeline from western Henan to Wuhan is under preparation. The railroad departments also plan to built a railroad from Kunming to Nanning. In this way, the coal of Guizhou can be shipped out.

Giving a Free Hand to Locally Run Mines

Besides the above technical and economic reforms, we still need to make reforms in other aspects. Especially in the reform of policies, we must relax policy in the future and give a free hand to the development of locally run coal mines. Now, coal mines operated by communes and brigades produce 130 million tons of coal. We are prepared to develop them to produce 200 million to 300 million tons. Later, we must establish regulations to prohibit mining in the following areas: under railroad lines, important highways, reservoirs, dams and dykes, cultural ruins, and important buildings. Without permission, no more small mines should be allowed to be built in state-owned mining regions. Other regions with coal mining resources should allow the masses to build mines. There should not be any control over the following: private funds, production and marketing by oneself, pricing by oneself, establishing wages by oneself, engaging in transportation by oneself. The following should be promoted: the masses should be encouraged to operate mines, the collectives should be encouraged to build mines, each province should be encouraged to build mines, regions with coal and regions without coal should jointly develop mines, small coal pits should be encouraged to generate electric power, small coal pits should be encouraged to develop gasification, small coal pits should be engaged in various types of transportation--pipeline transport, and cable transport. Transportation of coal must not be limited to the railroads. Of course, the state must also provide assistance in capital and technology.

We should grasp the backbone projects, especially the large projects in Huainan, Huaibei, Shandong, Hebei, Henan, Liaoning, Heilongjiang, Nei Monggol, and Guizhou. We must establish new technology, new technical process, new equipment, new management, and new systems. We cannot be like the past. We can cooperate with foreign firms and use foreign capital to develop model mines. Wages of coal mining workers must be linked to fixed quotas and contracted production. The more work done the higher the wages and the less work done the lower the wages. The building of mines should also be under contract and there should be rewards and penalties. Surplus capital should mainly be retained by the contracting unit.

We should rebuild old mines. The technology, technical process, labor and wage systems, and the management system of old mines must also be reformed. Of course, we cannot reform them entirely according to those of newly built mines. In summary, we must relax policy. Second, we must grasp backbone projects. Third, we must rebuild old mines. In general, in the past 30 years, we produced 600 million tons. We must increase output by 600 million tons in the less than 20 years remaining between now and the end of the century. Without opening up new ways, and without reforms, we will not realize this.

We Must Borrow Foreign Experience and Attract Foreign Capital

2. The problem of the open-door policy. There is indeed resistance to opening the doors of the coal industry but we must insist on doing so. One reason is that we need new foreign technology. Second, for more than 10 years,

foreign coal industry techniques and equipment have developed greatly while our nation basically did not undergo any great change. Things are still the same. To change the coal industry towards new management and new technology, we need to borrow foreign experience, not opening our doors will not work. The second reason is that our nation has a shortage of capital. Opening our doors to attract some foreign capital can hasten the progress in construction. In the past, our relationship with foreign nations was simple. It was purely a buy and sell relationship. Later, we must use various types of cooperation to obtain what we need. In the past, we only bought equipment. Now, we not only buy equipment, we must also bring in technology and finally we must be able to manufacture the equipment ourselves.

One type of cooperation is compensatory trade. For example, Japan's energy loans are actually a type of compensatory trade. Some civilian enterprises of France, Romania, Malta, and Japan are engaged in compensatory trade. Soon, we may sign a loan with Italy to be used for the comprehensive projects of developing coal in Guizhou, rebuilding railroads and harbors. China has established a Southwest Energy Development Company. The European Common Market is also interested in the development of energy in our nation's southwest.

Joint enterprises such as the joint development of the Pingshuo Open-Pit Coal Mine with Occidental Petroleum of the United States, the joint management of the No. 1 shaft of Luoning in Shandong with the Shell Oil Company of Britain are higher level cooperative efforts. The questions are more complex and require a longer time for engotiations.

Also, we can invite people to come and design projects. For example, in mining large open-pit mines, China lacks experience, so we invited West Germans and Americans to design the projects for us. Now, some efforts have already reached an agreement and some have signed contracts.

We should also utilize loans provided by the World Bank. For example, two mine shafts in Shanxi are prepared for mining using loans from the World Bank. The above efforts are economic cooperation. There is also technical cooperation, for example, the project of liquefaction research assisted by the United Nations, some coal science research projects assisted by Japanese funds. These are beneficial to training talent and introducing some scientific research equipment.

Now is a good time to utilize foreign capital. As long as we have truly feasible development projects, many nations are willing to provide loans to us, and the conditions are favorable. We can obtain long-term low interest loans.

China's coal is mainly for domestic consumption, but some is exported. Although many nations and regions need China's coal, the supply cannot completely satisfy demand. Last year, we only exported something over 6 million tons. In the near future, this will increase to some 10 million tons. China has also developed some medium and small coal mines for foreign nations,

providing geological surveys, technology, and equipment. Even the United States is interested in our development of small coal mines. In general, as long as we follow the decisions of the Central Committee, rely on policy and rely on science, and open up new ways, China's coal industry has a very bright future.

9296
CSO: 4013/161

COAL

EIGHT KEY COAL CONSTRUCTION PROJECTS ACCELERATED

HK280356 Beijing CHINA DAILY in English 28 May 83 p 2

[Text] China is expected to speed eight key coal construction projects as part of a drive to double coal output to 1.2 billion tons by the turn of the century, according to CHINA COAL NEWS.

The projects are the mining areas of Gujiao and Datong in Shanxi Province, Huolinhe in Nei Monggol, Yanzhou in Shandong Province, Huaibei and Huainan in Anhui Province, Tiefa in Liaoning Province, and Pingdingshan in Henan Province.

The eight projects involve 24 new reconstructed or expanded mines that will nearly double their annual production to 100 million tons, easing the energy shortage in Shanghai and East China.

The eight projects account for 41 percent of China's current coal output. Plans call for the 24 mines to increase production capacity by 24 percent this year. However, 25 percent of the goal had been achieved by the end of April with the peak construction seasons of summer and autumn still ahead, an official of the Coal Ministry noted.

Construction of four projects--Yanzhou, Huolinhe, and Huainan and Huaibei is going fast and the Coal Ministry is moving to hurry up the others, CHINA COAL NEWS said.

Yanzhou, Huainan and Huaibei have 11 mines under construction. Their planned capacity is 26.9 million tons, accounting for more than 50 percent of key construction projects in China's coal industry.

The Huolinhe in Nei Monggol is the largest opencast mining area in China. In the first four months of this year, its stripping volume rose 17 percent over the same period of last year. The mine is expected to produce 1.2 million tons next year, and reach its annual capacity of 3 million tons by 1985, the paper said.

Yanzhou, in the southwest Shandong plains, has 4 mines in which the first stage of construction has been completed. The mine in Xinglong village with a planned capacity of 3 million tons started operation in 1981.

Construction of the other three mines is in full swing. The Baodian mine, with an annual capacity of 3 million tons, is expected to be finished by 1985. Excavation of the shaft has been completed at the Dongtan mine, which has an annual capcity of 4 million tons. In the first 4 months, the Yanzhou mining area had finished 30.9 percent of its year's goal.

The Gujiao area in southeastern Shanxi Province has been given top priority as a coking coal base. Railways, roads and a 220,000-volt transformer have been completed there. The first stage of the mine with an annual capacity of 3 million tons, which was started in 1979, is expected to begin operation next year. Ground-breaking was done last year for the Zhenchengdi mine which has a capacity of more than 1 million tons, the paper said.

China has increased its annual investment to the equivalent of 13 yuan per ton of coal mine from an average of 7 yuan in 1979, the paper added.

CSO: 4010/67

MORE R&D WORK IN COAL GASIFICATION, LIQUEFACTION URGED

Beijing RENMIN RIBAO in Chinese 24 Apr 83 p 5

[Article by Yang Jun [2799 3182], Deputy Director of the State Scientific and Technological Commission: "Emphasize Transformation and Comprehensive Utilization of Coal"]

> [Excerpts] By concentrating on comprehensive utilization and transformation of coal, we can fully and rationally develop our resources and also create conditions for protecting the environment and controlling pollution. For this reason, this matter should be treated as a major issue of technological policy. Giving our attention solely to exploitation without attaching importance to raising the utilization ratio of coal is clearly incorrect and there should be a basic change in our ideology.

Coal accounts for more than 96 percent of our exploitable reserves of combustible minerals, 69 percent of our current energy consumption and 60-70 percent of our heavy industry raw materials. Intensifying the transformation and the comprehensive utilization of coal and effectively and rationally utilizing coal resources is of major significance in expediting modernization.

What we refer to as the transformation and comprehensive utilization of coal indicates primarily transforming coal into gaseous fuels and gaseous raw materials, liquid fuels, and chemical industry products. Over the past 20 years, because of the one-sided emphasis on the role of petroleum and on the policy of promoting it as a replacement for coal, the nation let up on its research and development work on the transformation and comprehensive utilization of coal to the extent that technology in this sphere became very backward, creating such problems as a low utilization rate of energy resources, poor economic results, severe pollution, and a large volume of transport. Eighty-four percent of China's coal is used directly in burning. However, 62 percent of it is burned in decentralized, small and backward facilities. At present, the heat efficiency of cooking ranges in popular use is only about 18 percent, while the heat efficiency of industrial boilers is in general only a little over 50 percent, a level that is about 15 to 20 percent below that in foreign countries. Thus, there is very great waste. Because the greater part of our raw coal is burned directly as fuel, there has been

very little development of research and construction for gasification and liquefaction of coal and for coal chemical industries so that the economic value of coal is very low. Large quantities of raw coal are consigned and shipped without having been washed. This has put very heavy pressure on the railroads. The air pollution and environmental damage created by the burning of coal are also very severe. For this reason, intensification of the transformation and comprehensive utilization of coal should become a major technological and economic policy of China for building up the economy.

Transformation and comprehensive utilization of coal covers a broad sphere and involves diverse elements. Thus, it cannot be fully accomplished in a short period of time. At present, we should stress a few key links and proceed on key points. In this way, we will be able to double the results with half the work. In the areas of coal gasification and the coal chemical industry in particular, we must devote a great deal of effort to research and development work. In regard to gasification of coal, estimates indicate that when 1 ton of commercial coal has turned into coal gas for civil use, it would be equivalent to burning 1.9 tons of coal, with heat efficiency being close to doubled. If coal gas were commonly used in our cities, the amount of coal used by city residents would be reduced by 40-60 percent, saving more than 10 million tons of commercial coal. It could also bring about great changes in the environment. However, we cannot use high-grade coal as a resource for gasification. Lignite or weakly cohesive coal, of which there are large reserves and which are widely distributed in China, can meet this demand. It can be seen that there are sufficient resources and bright prospects for promoting coal gasification in our nation. Moreover, by actively developing the coal chemical industry, we can bring the economic results of our coal resources into full play. If we transform coal into a raw material of the organic chemical industry, its economic value will be raised from several times to several dozen times. In addition, reforming backward coal-burning technology and conducting research on and developing coal liquefaction and generation of electricity by burning of coal and gas--combined circulation of vapor--will also be of major significance in raising the use value of coal and in increasing its economic results.

At present, we can adopt the following measures in order to intensify work on transformation and comprehensive utilization of coal: First, specialists can be organized to formulate overall plans for the transformation and comprehensive utilization of our coal, including technological policies, equipment policies, plans relating to key scientific and technical problems and plans for technological development, on a foundation of working out adequate proofs. Second, in respect to modes of organization, diverse forms of joint ventures should be organized adapted to local conditions in regard to coal, coal gas, the chemical industry, electric power, coking and construction materials on the basis of the principles of specialized cooperation and economic rationality. Third, efforts should be concentrated on establishing large-scale comprehensive utilization bases for coal as quickly as possible. Intense efforts should be made to carry out construction projects in all neighboring regions that have coal resources to meet the requirements for coal gas in daily life among inhabitants of large and medium-sized cities.

Fourth, technologically, advanced foreign technology should be imported and domestic science and technology should be organized to make a joint attack on key problems. In addition, we must break away from convention, adopt the method of raising funds from multiple sources, including state investment and investment by provinces, cities, departments, companies, enterprises, organizations and groups that receive the benefits, absorb the pooled funds from small numbers of shares held by residents and adopt the form of supplementary trade to utilize foreign investment in order to solve the problem of the required funds.

10019
CSO: 4013/201

MECHANIZATION OF SICHUAN'S UNIFIED DISTRIBUTION MINES

Chengdu SICHUAN RIBAO in Chinese 28 Mar 83 p 2

[Article by Li Xianfu [2621 7359 4395]]

[Text] Recently, the Songzao Bureau of Mines of the Ministry of Coal Industry sponsored a national working conference on the mechanization of coal mines. The objective of the conference was to exchange ideas; to stimulate development in the mechanization of coal mining operations; and to provide an opportunity for the delegates to examine and understand the thin-layer hydraulic support structure built by the Bureau and China's first eocnomy type composite mechanized coal mining equipment which is being tested at the Bureau.

Last year, mechanized mining techniques were used in 40 percent of the unified distribution mines around the country. Five mechanized mining teams produced more than 1 million tons of coal, which was comparable to the standards of advanced nations in the world. Considerable progress in the mechanization of coal mining was also made in this province. For example, since mechanized techniques were used by the Yongrong Bureau of Mines for mining 0.5-0.6 m ultrathin layers, the efficiency increased by 67.54 percent. In 1982, the No 4 well of the Rongchang mine produced 290,000 tons of unscreened coal, which exceeded the design capability by 38 percent; it was the first well in Sichuan to use mechanized coal mining techniques. Since 1973, the Songzao Bureau of Mines has used conventional machines at two of the surface mining areas; at the time, it bagan construction of passage ways in wells for mechanized production, and began modification of certain production segments. It also participated in a cooperative effort with the Chongqing Coal Research Institute to develop a hydraulic support structure for mining thin coal layers which has been used in conjunction with coal cutting machines in actual production. All the production segments, including excavation, loading, tarnsportation, and support, have been mechanized. The No 1 mine of this bureau became the first shaft to use hydraulic support structures: Last year it reached its design capacity for the first time, producing 600,800 tons of raw coal.

The use of hydraulic support structures in thin coal layers greatly reduces the amount of labor required, improves safety, and increases the unit area productivity and labor efficiency. It also reduces the consumption of materials and production cost; compared with conventional mechanized mining methods,

the labor efficiency is increased by 54.72 percent, and the consumption of pit support lumber per 10,000 tons of coal produced is reduced by 64.46 cubic meters. To increase production on a large scale, it is also necessary to mechanize mining procedures for medium and thick coal layers. The Songzao Bureau of Mines has 60 percent of its coal reserves in the form of medium and thick layers. Last year, the Ministry of Coal Industry asked this bureau to perform industrial tests on the first economy type composite mechanized coal mining equipment. In the future, this equipment will be introduced to other regions. The equipment was designed in accordance with the unique features of China's medium and thick coal layers, and it is relatively inexpensive. After more than 40 days of production tests, its performance has proved to be satisfactory, with daily production of over 1000 tons of raw coal.

Coal mines with similar geological structure and characteristics as those of the Songzao Bureau of Mines account for 70 percent of the coal mines in this country; they also account for a high percentage of coal mines in this province. Based on the actual production of these mines, one can be quite optimistic about the mechanization of coal mines in the future. This year, the degree of mechanization of coal mines in this country will reach 43 percent.

3012
CSO: 4013/186

GEOLOGICAL TEAMS INTENSIFY WORK TO IDENTIFY YUNNAN'S COAL RESERVES

Kunming YUNNAN RIBAO in Chinese 14 Jan 83 p 2

/Article by Wang Zhengduan /3769 2973 4551/: "Yunnan's Geological Department Organizes Forces To Strengthen General Survey and Prospecting for Coal as the Major Source of Energy"/

/Text/ Yunnan's geological department has organized forces to strengthen general survey and prospecting for coal as the major source of energy.

Yunnan's coal resources are abundant. The reserve of lignite of the Tertiary Period ranks first in the nation. Yunnan is one of the few provinces south of the Chang Jiang that does not lack coal. Since last year, the provincial geological department followed the glorious goals proposed by the 12th Party Congress and the concrete arrangements made by the Ministry of Geology for strengthening geological work in coal fields, organized related personnel in production, scientific research and technical management departments to conduct in-depth surveys and studies on the basis of evaluation and forecasts of the province's regions rich in coal and regions with a bright future for development of coal conducted by the provincial coal field prospecting company, formulated ideas about long-range plans, and drew up geological work plans for coal fields in the near future. Sichuan, Yunnan, and Guizhou Provinces, which have been included in the "survey and geological study of the future of coal fields of the late Permian Epoch in the three provinces of Sichuan, Yunnan, and Guizhou" are one of the 59 key regions designated by the Ministry of Geology as places to conduct general surveys of mineral ores. The coal-containing area in the northeastern part of Yunnan covers over 3,000 square kilometers. The emergence of the coal series is nearly 1,000 kilometers long. The forecast long-range reserve is several billion tons. Concerned departments have compiled detailed working plans and overall designs for this region. The long-range survey of the coal-containing region of Yanjin-Weixin-Zhenxiong must be quickly completed to provide a scientific reference for the long-range development and rational distribution of the province's coal industry. The Fuyuan and Laochang areas are another important coal mining region where work has begun in recent years. The area of preservation of coal series is large and as many as 15-18 of the seams can be exploited. The average thickness of a single layer is 1.5 to 3.5 meters, the quality of coal is good, the sulfur content is low, and the thermal output

can reach over 6,000 kilocalories. The precisely known reserves amount to 800 million tons and there are more than 2 billion tons of long-range reserves. The provincial geological department transferred geological technicians and mineral prospecting and construction forces, operated 8 to 9 drilling machines, intensified the search for minerals in peripheral areas, and expanded the future for the mining region.

Most of Yunnan's coal resources are concentrated in the eastern part and the northeastern part of the province. The broad regions in western and southern Yunnan lack industrial and civilian coal. Since last year, geological work teams have established surveying groups for Quaternary peat, launched surveys of civilian coal and chemical fertilizer resources, selected key mining regions for general surveys, determined the value of humic acid, lignite wax, and coal tar, and proposed the direction for comprehensive utilization. Also intensified was the general survey and search for coal in Dehong, Xishuangbana, Nujiang, Lincang, Simao, Baoshan, and Dali prefectures where traffic is inconvenient and where there are coal shortages. In addition, corresponding arrangements have been made to conduct a general survey of and prospecting for medium- and low-termperature underground hot water in the Hunming and Tengchong areas.

9296
CSO: 4013/154

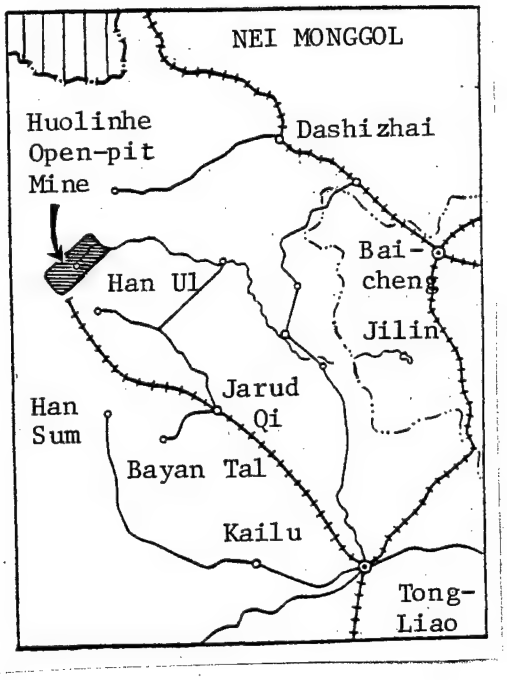
WORK PROCEEDS APACE ON HUOLINHE MINE; NEW RAILROAD NEARS COMPLETION

Beijing RENMIN RIBAO in Chinese 29 May 83 p 2

[Excerpts] The Huolinhe Mining District is located within Jurad Qi, Zhelimu League, close by our northeast industrial base. Before the end of this century, a huge surface mine with a yearly production capacity of 50 million tons will be built. This will be 12 times the yearly production of the Fushun Western Open-pit Mine. It will play a major role in transforming the energy picture in the nation's Northeast and in promoting industrial and agricultural production in Nei Monggol.

The Huolinhe coal field covers an area of 540 square kilometers. The geological reserve comes to 12.9 billion tons, including the Shaerhure open-pit zone with its known reserve of 2.5 billion tons. The coal is brown coal [lignite] and there are 24 coal-bearing seams with a maximum thickness of 81 meters. The field's geological structure is simple and the overburden is not great, facilitating surface mining. According to plans, mining will be carried out in stages. For the southern open-pit mine, now under construction, the first-stage project calls for the production of 3 million tons a year. If construction is completed by the third quarter of 1984, production could begin at once.

Construction of associated projects to support the mining region is keeping pace. A 400-kilometer rail link to the Huolinhe Mining District will soon be finished, possibly being officially opened by the end of the year. A 163-kilometer highway and a 161-kilometer communications line linking the mine with Jurad Qi [Lubei] have already been completed and are now in use. Electricity is now being supplied by a 6000-kilowatt power plant.



Map showing the location of the Huolinhe Open-pit Mine.

CSO: 4 913/243

WORK INTENSIFIED ON NATION'S LARGEST COKING COAL BASE

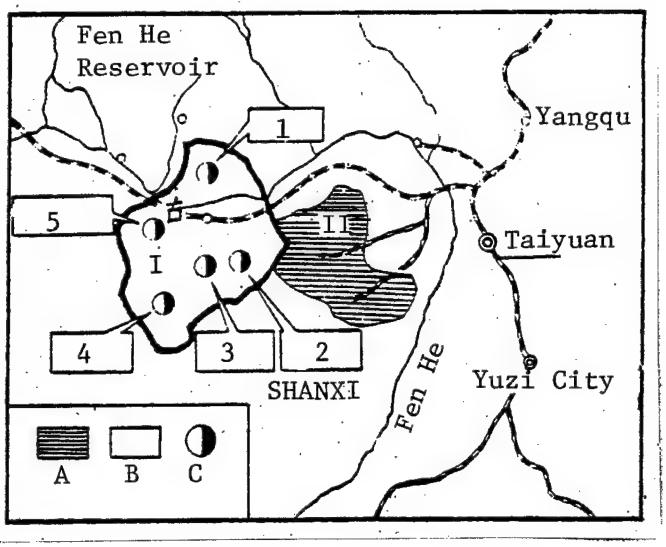
Beijing RENMIN RIBAO in Chinese 2 Jun 83 p 2

[Excerpts] Work on the nation's largest coking coal production base to be built during the Sixth Five-Year Plan--the Gujiao Mining Region in Shanxi--is being accelerated. Measuring 20 kilometers from east to west and 16.5 kilometers from north to south, the site now employs more than 20,000 workers.

The Gujiao Mining Region is situated just over 100 li west of Taiyuan in the Luliang Mountain Range. The Fen He runs from west to east through the heart of the mining region. The underground coal seams are rich with a total verified reserve of 4.57 billion tons. The quality of the coal is excellent, with more than 70 percent of this amount being coking coal grade. According to the State-approved overall plan for the region, five pairs of large-scale mines are to be constructed, four of which will have an annual production capacity of more than 3 million tons each for a total yearly design output of 16.5 million tons.

Gujiao coal is characterized by its low ash content, low sulphur content, and its good flow properties during the coking process. Strongly cohesive, it is known as the "type '0' blood" of coking coals.

According to plans, coal shipped out by the Gujiao region will be pre-dressed fine coal. For this reason, two coal dressing plants are now being built as part of the region's mine construction effort. Support facilities are also taking shape. Dotting both sides of the Fen He are living quarters, offices, hospitals, shops, and schools either well along in the construction phase or just beginning.



Key:

I. Gujiao Mining Region
II. Xishan Mining Bureau
1. Xiqu Mine
2. Dongqu Mine
3. Tunlan Mine
4. Malan Mine
5. Zhenchengdi Mine
A. Old mining region
B. New mining region
C. Shaft

CSO: 4013/242

BIG NEW COAL DEPOSITS FOUND IN SICHUAN'S SHIBAO REGION

Chengdu SICHUAN RIBAO in Chinese 1 Apr 83 p 1

[Article by Liu Jingshi 0491 4842 0013]

[Text] After 2 years of exploration, the Southeast Sichuan Geological Brigade of the Sichuan Bureau of Geology has discovered estimated new coal deposits of more than 1.8 billion tons in the Shibao region located in Gulan County in southern Sichuan. The discovery of this coal mine will contribute a great deal toward relieving the pressure of energy shortage in the province, and provide abundant energy resources for economic development at the end of this century. This year, the mine has been designated as one of the high priority national resources which will be further explored, surveyed, and evaluated.

The Gulan Shibao coal mine is located at the intersection of the three provinces of Sichuan, Yunnan, and Guizhou, and borders the Yun-Gui Plateau. This region has many high mountains and forests, and is sparcely populated; it is a difficult region for geological exploration. During the past 2 years, members of the Southeast Sichuan Geological Brigade, motivated by the revolutionary spirit of the Red Army's crossing of the Chishui, constructed a 1:25,000 geological map covering several hundred square kilometers of this region. In the process, they overcame very difficult working conditions such as long supply lines, inadequate manpower, and shortages of food and water. In a systematic investigation of this region, a considerable amount of engineering work was done above ground by taking samples of the coal layer structure. A study of the stones and lava in the region and a 1:50,000 hydrological and geological survey of the region were also conducted to determine the geological structure, surface hydrology, and earth stratum variations in the region. This provided a preliminary picture of the extent of the coal stratum, the distribution of coal layers, the number of layers, the thickness of each layer, the quality of coal deposits, the coefficient of coal content, and the laws of variation.

The Shibao coal mine currently has control of over 0.6 billion tons of high-quality anthracite coal reserves. The southeast wing of the mine contains 9 layers of extractable coal; each layer is 0.5-3 m thick, with a total thickness of 8.33 m. The northwest wing contains 3-4 layers of extractable coal, with an average thickness of 4.58 m. In addition, in the Gulan, and Xuyong regions, coal deposits are distributed over an area of more than 4,000 square kilometers, which provides excellent opportunities for future exploration.

3012
CSO: 4013/186

NEW SHANXI GOVERNOR MAKES PITCH FOR FOREIGN INVESTMENT IN COAL DEVELOPMENT

OW292142 Beijing XINHUA in English 1615 GMT 29 Apr 83

[Text] Taiyuan, 29 April (XINHUA)--More foreign funds will be welcome in developing the rich coal resources in Shanxi, the new provincial governor said today.

Speaking at the current Provincial People's Congress now in session, Wang Senhao said that his province has the biggest coal reserves in China, and is now building or will soon start building six coal mining projects having a combined design annual capacity of 28.7 million tons, using foreign investment.

Four of the six projects, he said, are being opened with energy loans provided by the Export and Import Bank of Japan. They will be able to produce 12.5 million tons among them annually.

The Pingshou opencut mine, which will be opened with investment from the Occidental Petroleum Corporation of the United States, will have an annual capacity of 15 million tons when the first stage of work is completed, he said. The other is a coking coal mine with an annual capacity of 1.5 million tons to be opened with the cooperation of Romania.

Negotiations are now going on with the World Bank on the opening of two coal mines, each producing 4 million tons a year, Wang Senhao said. One will produce quality anthracite and the other steam coal.

"We plan to open four more coal mines and we are ready to operate with any foreign firms who wish to invest in our coal development program," the new governor declared.

He added that a letter of intent has been signed with a U.S. firm to build a coal slurry pipeline from Changzhi in south Shanxi to Nantong at the mouth of the Chang Jiang to solve the province's transportation problem.

The province now employs 71 complete sets of fully mechanized coal cutting equipment, some imported from Britain, West Germany, Japan and France, and the others made in China, he said.

Selected foreign technologies and equipment will be imported for revamping the old coal mines, building new roads, developing light industry and environmental protection in the future, Wang added.

The former chief engineer of the Ministry of Coal Industry disclosed that the province expects to produce 164 million tons in 1985, 210 million tons by 1990 and 400 million tons in 2000.

CSO: 4010/60

BRIEFS

NEW HEILONGJIANG FIELD--Harbin, 26 May (XINHUA)--A new coal field with reserves verified at 1.15 billion tons has been discovered in the eastern part of Heilongjiang Province, provincial authorities report. The number of extractable coal seams of the new field near Shuangyashan City is estimated from 13 to 18. [Text] [Beijing XINHUA in English 1227 GMT 26 May 83 OW]

LIAONING MINE CONSTRUCTION--Shenyang, 29 May (XINHUA)--Eleven mines with a combined annual production capacity of 6.17 million tons of coal are now under construction in Liaoning Province, northeast China, according to the provincial coal mining administration. Work will be started to build and expand a number of other mines in the province this year. Liaoning Province, China's leading heavy industrial center, consumes one-tenth of China's total energy output. An annual average of 20 million tons of coal has to be shipped into the province from other parts of the country to supplement local production. In 1982, Liaoning produced more than 40 million tons of coal. The province has a total known coal reserve of 7.1 billion tons. Liaoning's energy supply is expected to be improved by 1990, when 63 newly built or expanded mines with a combined production capacity of 18.9 million tons will be in operation. [Text] [Beijing XINHUA in English 0751 GMT 29 May 83 OW]

SHENYANG MINE CONSTRUCTION--Shenyang, 26 May (XINHUA)--Eleven mines with an aggregate annual production capacity of 8.5 million tons are now under intensive construction here in Shenyang, a heavy industrial city in northeast China. With 3,295 factories, the city needs several million tons of coal every year, for every 1,000 factories need to burn an annual average of 2.1 million tons. In 1982, 1.3 million tons of coal were shipped here from other parts of the country. The 11 mines in the Shenyang coal mining area constitute one of China's major energy projects now in progress. When completed, they are expected to help improve the situation. Verified coal reserves under the city total 2 billion tons. [Text] [Beijing XINHUA in English 1255 GMT 26 May 83 OW]

LIAONING COAL DEVELOPMENT--Shenyang, 7 May (XINHUA)--Construction of a shaft mine, with a designed annual capacity of 1.2 million tons of coal, is under way in the heavy industrial province of Liaoning in northeast China. The Wangjiaying mine, located near Fuxin City, is reported to have

enough reserves of high-quality coal to last for 100 years. Started in May 1978, the project is scheduled to go into operation in 1987. Construction of the main and auxiliary shafts, as well as 4,421 meters of tunnelling has now been completed. Construction of the pits and building and installation of equipment are now under way. In order to facilitate coal production, Liaoning Province has established the Shenyang Mining Administration to develop the coal industry in this area. The total annual production capacity under the administration is about 6 million tons of coal. [Text] [OW080448 Beijing XINHUA in English 1551 GMT 7 May 83]

NEW ANHUI MINE--Hefei, 20 Apr (XINHUA)--Construction of a new coal mine with an annual capacity of 3 million tons is nearing completion in a coal mining center of Anhui Province, East China. The Panji No. 1 coal mine on the northern bank of the Huai He in Anhui is one of the biggest under construction in China. Facilities for ventilation, pumping, transportation and communications have been built. The mine is expected to go into production in September of this year. The mining area is in an alluvial plain. The geological structure is complicated. Chinese engineers have developed the techniques needed to construct the mine after 10 years' study. Two more mines with similar capacity are also under construction in the area. [Text] [OW201230 Beijing XINHUA in English 1148 GMT 20 Apr 83 OW]

CSO: 4010/69

MINISTRY OF GEOLOGY AND MINERAL RESOURCES DETERMINED TO DOUBLE OIL AND GAS OUTPUT

Jiangling SHIYOU YU TIANRANQI DIZHI /OIL AND GAS GEOLOGY/ in Chinese Vol 4, No 1, Mar 83 pp 115

/Article by Lu Hua /0712 5478/ and Zhang Shaowei /1728 4801 4850/: "Ministry of Geology and Mineral Resources Holds Meeting, Decides To Be Vanguard in Doubling Oil and Gas Output"/

/Text/ From 15-26 December 1982 the Ministry of Geology and Mineral Resources held a Petroleum Geology Working Conference in Beijing and made an important decision "to launch the second general survey for oil and gas in new fields and regions, for new types of oil and gas with a new intensity, in a planned, phased manner, throughout the nation, to realize major breakthroughs, to discover oil and gas fields, to find some strategically important bases of oil and gas resources, to create conditions to double China's annual output of oil and gas by the end of this century and to be a vanguard."

The conference was presided over by Minister Sun Daguang /1327 1129 0342/ of the Ministry of Geology and Mineral Resources. Attending the conference were 205 delegates from 32 units subordinate to the ministry. They included some famous old experts and a large number of middle-aged scientific and technical personnel in petroleum geology, physical prospecting, and petroleum engineering. Delegates from the State Planning Commission, the State Economic Commission and the Ministry of Finance and reporters from major news agencies in the capital were invited to attend.

The central theme of the conference was how to develop a new situation in general survey for oil and gas. Emphasis was on solving problems in the guiding ideology for a nation-wide general survey for oil and gas, strategic deployment and important measures that should be taken. A concensus was reached at the meeting, confidence was strengthened, the people's spirit was lifted, and the goals of struggle were united.

The conference summarized past experiences in searching for oil and gas, and conducted a conscientious analysis of the subjective and objective conditions for general surveys for oil and gas in the future. Everyone believed that the long-range estimate of between 30 billion and 60 billion tons of geological reserves of petroleum in China is appropriate, and the presently known reserves are only one small part. The potential is still great. Besides the already

verified regions and types of oil and gas regions, there are still broad new fields, new regions and new types. The participants fully proved 8 new fields and 28 new regions, all of which have a fairly large potential for reserves. We should conduct general surveys on a broad scale. Delegates to the conference believed that there is hope in finding the geological reserve needed to double the output of oil and gas and that it is entirely possible. But the goal of future work is more complex and more difficult and the key is to work hard. We must dare to create new things, acquire a new ideology, new techniques, and new methods.

The conference decided on the strategic direction of the general survey for oil and gas and the key regions to be surveyed in the next 10 years:

First, we must continue to expand the long-range estimate of oil and gas in large sedimentary basins in the central and eastern parts of the mainland. The key locations are the upper Triassic Series and Jurassic System in the western and northern parts of the Sichuan Basin, the Carboniferous-Permian System in the Ordos Region and the North China region, and the upper Jurassic-lower Cretaceous Series in the southern part of the Song-Liao Basin.

Second, we must hasten the investigation of oil and gas resources in the ocean. The key is to qickly evaluate the basins of the continental shelf of the East China Sea and at the same time develop surveys for the regions of the South China Sea.

Third, we must actively develop the reserves of oil and gas resources in the Northwest, and the key is the Tarim Basin.

Fourth, we must gradually develop the general survey of non-anticlinal oil and gas pools and complex tectonic belts. The key is the sedimentary traps in the large depressions of oil genesis in the basins of the Cenozoic Era and the reverse covered rift zones.

Fifth, we must insist on exploring the conditions for oil and gas storage in the regions with a distribution of carbonatite of the marine facies of the Paleozoic Group. The key is the upper Yangzi Paleozoic Group and the marine facies of the lower Yangzi Mesozoic and Paleozoic Groups.

The conference also established the general strategy of deployment, arranged several near-term projects, and studied the most important measures that should be taken to create a new situation in oil and gas geology on an overall basis. We must especially emphasize reliance on scientific and technical progress and the training of personnel. At the same time, we must reorganize the teams, and carry out reforms to elevate the work in oil and gas geology to a new level.

9296
CSO: 4013/196

OIL AND GAS

CHINESE LEARN VALUABLE LESSONS FROM FRENCH PROSPECTING TEAMS

Jaingling SHIYOU YU TIANRANQI DIZHI /OIL AND GAS GEOLOGY/ in Chinese Vol 4, No 1, Mar 83 p 132

/Article by Tao Xingeng /7118 9515 5087/: "French Petroleum and Seismological Prospecting Teams in Xinjiang"/

/Text/ Three French petroleum and seismological prospecting teams are in the Junggar Basin in Xinjiang working on the unpopulated gobi banks. They were sent to China by the French Geophysics Company (abbreviated CGG) under the Sino-French petroleum and seismological prospecting service contract to conduct seismological prospecting work for 3 years. At the same time, two production technology management groups were also sent to China to guide seven of our seismological work teams in the Junggar Basin. More than 50 French experts will work on the projects.

The CGG company of France is a company with a long history. It was established in April 1931 and today has 70 land and marine seismological teams working in 35 nations around the world. They include 25 controlled seismic source teams, 20 blasting teams, 5 detonating cable teams and 20 mobile seismological teams. Among them, 40 percent of the teams use 48-channel instruments and the rest use 96-channel and 240-channel instruments. In petroleum and seismological prospecting, the company occupies a definite position in the world.

The French petroleum and seismological prospecting teams arrived in China in October 1980. They combed the Junggar Basin to survey the seismological cross-section and penetrated into the "forbidden region" of seismological prospecting--the desert. They insisted on working through the entire year and their efficiency was high. A well-blasting seismological team using 24-channel instruments can complete an average of 88 kilometers a month, and visible geological achievements have already been obtained. For more than 2 years, they have discovered and proven more than 10 local structures and more than 10 rifts, and provided several positions for prospecting wells. One well manifested indications of oil and gas in the Jurassic System and the Permian System after prospecting. Except for the less-than-ideal quality of data gathered in the large desert region, the geological tasks in other regions have been completed or basically completed.

In the production process, China's petroleum prospecting workers have acquired a lot of good experience. In particular, their business management is very good. Field construction adhered to five strict rules: strict measurement and laying lines; strict adherence to the depth of wells and distance between wells; strict combining of diagrams from seismological channels, distances and detectors; strict requirements for microscopic measurement holes and small refraction data; and strict maintenance of equipment. Although work was affected by the complex and variable environmental conditions outdoors, work proceeded like a well-managed shop. The French seismological team leaders arranged daily production work and frequently went out to inspect the intersecting points of measuring lines, devoting a lot of attention to the safe operation of various tasks. Each day, they inspected and evaluated primary data. They personally organized the small refraction and microscopic well logging data. When unqualified data were discovered, the work was immediately repeated. China's workers have become accustomed to such strict demands and management and can work according to requirements. They would not return to camp without completing the day's work quota.

Living together has forged deep friendships between colleagues of the two nations. The French experts enthusiastically taught techniques and the technical standard of China's workers greatly improved. Now, Chinese engineering and technical personnel and workers carry out independent operations in the main production and construction links for the three French seismological teams while the French experts provide guidance. China has also taken the initiative to make them comfortable. They said happily: "We are very happy to travel far away from our motherland to come here to work. It is like being at home. We feel a warm friendship everywhere."

9296
CSO: 4013/196

NUCLEAR POWER

CONSTRUCTION OF QINSHAN NUCLEAR POWER PLANT GETS FULL BACKING FROM LOCAL ORGANS

Hangzhou ZHEJIANG RIBAO in Chinese 14 Jan 83 p 1

/Article by Chen Youheng /7115 2589 1854/: "Qinshan Nuclear Power Plant Puts in Electricity, Water, and Roads, Prepares Construction Site; All Sectors in Haiyan Help in Building the Nuclear Power Plant"/

/Text/ The leading organ of the Qinshan Nuclear Power Plant of the Ministry of Nuclear Industry established its station in Haiyan in December of last year. It has received the enthusiastic attention and support from local party and administrative leadership and the cadres and masses. At present, the work of putting in electricity, water and roads and leveling the construction site is being carried out intensively.

Since the state decided to build the Qinshan Nuclear Power Plant, the county committee and the county people's government of Haiyan have included the various support activities to build the nuclear power plant into the daily agenda of important business of the departments of the local party committee and the government. They have assigned special people to be in charge, mobilized and coordinated various related departments to conscientiously do the work well and to implement the work level by level. The county leadership took into consideration the needs in launching the work of the nuclear power plant. Since there was no facilities for the power plant staff, they took the initiative to provide 31 rooms with more than 160 beds at the county hostel for the staff to use as offices and dormitories. They also asked the county post and telecommunications department to install seven telephones. When the county learned that the staff required a parking lot, the county hostel released a large space originally intended for capital construction as a temporary parking lot. The county materials department also took the initiative to provide bamboo, bricks, and tile and other construction materials to help them build the structure for the parking lot. The leadership of the county commerce bureau visited the staff to solicit opinions, opinions, and arranged for the commercial services required by the nuclear power plant. After the county power company was given the task of building the power grid from Haiyan to Qinshan, it quickly completed the task well. The original work of that department was rearranged. Technicians were dispatched to actively conduct surveys and draw up designs with the staff members. The masses of cadres of the Changchuanba Commune, where the Qinshan

County seat is located, actively performed related support tasks and also began planning the construction of the commune, the central market and the town, commercial facilities and the development of commune and brigade industries.

9296
CSO: 4013/154

SUPPLEMENTARY SOURCES

TECHNICAL, ECONOMIC CONSIDERATIONS IN DEVELOPMENT OF WIND POWER PRESENTED

Beijing NENG YUAN [JOURNAL OF ENERGY] in Chinese, No 6, 25 Dec 82 pp 42-43

[Article by Sun Mingpei [1327 2494 3805]: "Hastening the Development of China's Wind Energy Resource"]

[Text] In recent years, the shortage in the supply of petroleum has become more and more serious. To solve the energy problem, research agencies of some nations have proposed the strategic issue of initiating a transition to new forms of energy and are using every possible way to find alternative sources of energy. In this situation, the study of wind energy to generate electricity has been proposed. Since 1973, the United States has invested US$400 million, their method being to develop small-scale projects and then medium-scale and large-scale projects, such as the Model-0 100-kilowatt wind-powered generator, the Model-0A 200-kilowatt wind-powered generator, the Model-1 1000-kilowatt wind-powered generator and the Model-2 2,000-kilowatt and 4000-kilowatt wind-powered generators. Internationally, the Model-2 is the largest. It uses a horizontal shaft, the diameter of the metal blades is 91 meters, and the tower is 60.9 meters high. Some reports indicate that starting from 1983, the United States will build a group of wind-powered generators. In regions with relatively strong winds, the manufacture cost and the cost of generating electricity by such generators will be able to compete with conventional power plants.

China's research in wind-powered generation of electricity began in the 1950's. Such research has been intensified in recent years and progress has also been faster. The vertical shaft and horizontal shaft wind-powered generators developed by our nation have diameters of 3.2 meters to 6 meters. The capacity of the generators range from 1 kilowatt to 8 kilowatts. The largest generators include the 18-kilowatt generator on Shengsi Island. It is a horizontal shaft wind-powered generator with a diameter of 16 meters. On-site experiments in natural wind show the performance is good.

A. Trends in Development of Wind-Powered Generation of Electricity

Before the 1970s, the price of petroleum was cheap and people were not concerned about the development and utilization of wind resources. After 1973, the price of petroleum rose again and again, and, with environmental pollution caused by petroleum and other fossil fuels, people began to pay attention to natural energy.

In view of the development in various nations, the trend of development in wind-powered generation of electricity is as follows: (1) It will solve the problem of using electricity in regions where there is wind but no electric power. Most of the generators will be small wind-powered generators with capacities of from 5 to 10 kilowatts. Larger generators require the consideration of energy storage or parallel operation with diesel generators and small hydroelectric power stations. The means of energy storage are mostly batteries, and the greater the storage capacity the higher the manufacturing cost. This is one major obstacle in developing wind-powered generation of electricity. The direction of research in each nation is concentrated in simplifying equipment and reducing manufacturing cost. For example, using wooden blades instead of metal ones, using a planetary gear or a backpack type for transmission, not using tail fins in a downwind position, using a completely sealed generator without an outer casing, and using a centrifugal device to adjust the spacing between blades can all reduce manufacturing cost. There are also efforts to install inductive generators according to the actual situation at the place of use. Various methods of energy storage are being studied for electricity users in isolated regions to improve the general economic result so that the unit cost can match or be lower than the cost of generating electricity by diesel fuel and so that the cost can be low enough to be purchased by individuals. (2) It can solve the problem of conserving regular energy sources in regions that have wind as well as electricity. In this case, consideration has been given to developing large- and medium-sized wind-powered generators with an installed capacity usually more than 100 kilowatts. At present, international scientific research is mostly concentrated in this aspect. There are about 10 horizontal shaft generators of the 1 million-watt class in operation. The capacity of the vertical shaft Φ model has already reached 250 kilowatts. According to reports, Canada is building a Φ model vertical shaft generator with blades 64 meters in diameter. The blades are 2.4 meters wide, the total height is 100 meters, the capacity is 3,800 kilowatts, and the annual output of electricity if 6,100,000 kilowatt-hours. It is expected to begin operation in 1983. Problems in the use of large generators, such as the control of wind-powered generation of electricity, the juxtaposition of such generators and power networks, stable operation, prevention of lightning, television interference, site selection, arrangement of batteries of generators, and noise, have all been exhaustively studied and considerable progress has been realized. The cost is expected to be competitive with conventional power plants after several years.

B. The Technical and Economic Value of Using Wind-Powered Generation of Electricity as a Supplemental Energy Source

Wind energy is a kind of regenerative energy. Present practice shows that besides interference with television when the generators are operating, no other environmental effects have been discovered. The major existing problem is the technical and economic efficiency, i.e., the manufacturing cost is rather high.

1. The manufacturing cost of small wind-powered generators is higher. Abroad, the manufacturing cost is about 2,000 to 3,000 US$/kilowatt (about 3,000 to 5,000 yuan). The manufacturing cost in China is about 2,000 to 3,000 yuan/kilowatt. If output is increased, the cost of an ordinary wind-powered generator can reach 2,000 yuan/kilowatt.

2. The manufacturing cost of large generators is also high, but it decreases as the single generator capacity increases. For example, the manufacturing cost of the 2,000-kilowatt prototype Model-1 generator of the United States was US$3,000 per kilowatt. The cost to generate electricity was US$0.17/kilowatt-hour. The manufacturing cost of the Model-2 prototype of the United States was US$6,000,000, the capacity was 2,500 kilowatts, and the construction cost was US$2,400/kilowatt. If it is batch-produced, this can drop to US$2,000,000, about US$800/kilowatt, and the cost would be US$0.05/kilowatt-hour, becoming competitive with ordinary electric power.

In China today, the horizontal shaft 75-kilowatt generator has a manufacturing cost of about 2,700 yuan/kilowatt and the cost to generate electricity is 0.10 yuan/kilowatt-hour. If it is developed to 500 kilowatts, the manufacturing cost would be 2,000 yuan/kilowatt and the cost of generating electricity would be 0.07 yuan/kilowatt-hour.

C. China's Wind Energy Resources

China's wind energy resources are fairly abundant. They are described by region as follows.

1. The southeast littoral, the coastal areas of eastern China and northern China and the island regions described previously.

These are regions in which the annual average wind velocity is 6 to 7 meters/second (see Table). These regions have a more urgent need for electricity, and at the same time, we must also solve the problems of fresh water and electricity for electric lighting, television, etc.

2. Northwest Grazing Region

Here, the topography is high, wind velocity is high, and the area covers several hundred thousand square kilometers. The Siberian high pressure system becomes a cold front moving from north to south or to the southeast in winter and spring. After entering China, it is blocked by the Altay Mountains, Tianshan and Kunlunshan. It enters the northwest region and the North China Plain. In winter and spring, winds and sandstorms are strong. The average annual wind velocity is over 4 meters/second. This region is vast and the population sparse. The residential areas are scattered, fuel is extremely scarce, and people urgently need electricity.

Regions in China With Average Annual Wind Velocity Surpassing 6 meters/second (partial list)

Region	Wind velocity (meter/second)
Changshan, Nei Monggol	6.0
Baoyingtu, Nei Monggol	6.0
Qiandamen, Nei Monggol	6.0
Gumaihai, Nei Monggol	6.0
Chaojin Island, Shandong	6.4
Chongwu, Fujian	6.8
Jidao, Shandong	6.9
Jiuxianshan, Fujian	6.9
Daishan Island, Zhejiang	7.0
Huishan, Zhejiang	7.0
Dongsha, Guangdong	7.1
Shengsi Island, Zhejiang	7.2
Dongshan Island, Fujian	7.3
Helanshan, Gansu	7.8
Chengshantou, Shandong	7.8
Nanji, Zhejiang	7.8
Taishan, Fujian	8.3
Wutaishan, Shanxi	9.0
Tianchi, Jilin	11.7

3. The Southwest Mountainous Region

At the wind gaps at some regions, the wind velocity is high and the direction of the wind is stable. A small wind gap is like a small coal mine.

In general, because of China's geographic location, wind power resources are relatively abundant. Rationally developing and utilizing them will be a tremendous help in solving our energy problem and in providing electricity for use by residents in remote border regions. But China's meteorological stations are too sparsely distributed, and there is still no detailed statistical data that can serve as references to develop wind power resources. Therefore, we cannot make a more concrete evaluation of our wind power resources. This writer hopes that work in this regard can be strengthened to obtain more reliable data on wind energy and to draw isotachs as reference for planning departments.

D. It Is Necessary To Accelerate the Development of Wind Energy

Our nation is vast and materially rich, the population is large, and of the 1 billion population, 800 million are farmers and herdsmen. Not only is there an energy shortage in the cities, farmers and herdsmen experience a more serious lack of fuel. Under present economic conditions it is difficult to solve the problem of energy for use by farmers and herdsmen

in remote border regions by relying only on regular energy. The utilization of natural energy, such as large-scale development of hydraulic power, solar energy, wind energy, geothermal energy, and methane energy is truly feasible. Especially in regions that lack water, arid regions, windy regions, and the littoral regions and islands, it is necessary to fully utilize the resource of wind energy. The following are several opinions on the development of wind energy:

(1) We should establish a method to conduct a general survey of wind energy and organize forces to rapidly conduct general surveys of wind energy.

(2) We should select the best sites for installing wind-powered generators based on the general survey and according to wind direction, and establish a 10-year plan for the development of wind energy.

(3) We should establish an economic policy for the development of wind energy and rules on electric power. We should have policies to encourage residents or enterprises to utilize wind powered centers to generate electricity, and provide low interest loans for them to purchase generators. Enterprises manufacturing wind-powered generators should be given technical guidance and economic support.

(4) We should greatly develop the manufacturing industry for wind-powered generators. China's manufacturing industry in wind-powered generators has developed rapidly in recent years, the quality is good, and the manufacturing cost is low. But there are still some key problems that need to be solved, for example, in the design of the blades, in manufacturing technology and in the selection of materials and quality. Blades made of glass fiber reinforced plastic preform well but their price is high. The prices of aluminum and wooden blades are low, but the number of years of use is short. We should organize forces to make technical and economic evaluations. In addition, there are also problems that need to be solved rapidly by organizing forces and by concentrating efforts to overcome difficulties, such as the transmission mechanism, automatic control, the selection of materials and the shape of the towers, the joint operation of large and medium wind-powered generators and power networks, the selection of sites for the power stations, environmental impact, etc. Solving these problems will be very important to developing wind energy resources.

9296
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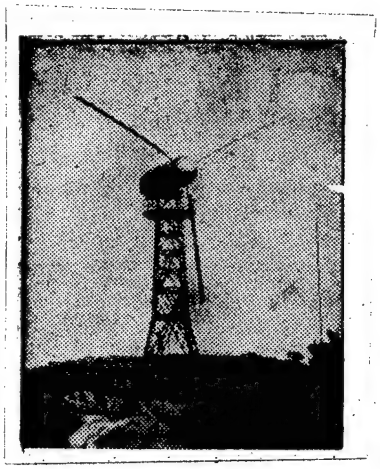
SUPPLEMENTAL SOURCES

NATION'S FIRST 40-KILOWATT WIND-POWERED GENERATOR NOW OPERATIONAL

Hangzhou ZHEJIANG RIBAO in Chinese 2 Apr 83 p 1



[Text] After operating normally for more than 500 hours, China's largest wind-powered generator, the 40-kilowatt station on Sijiao Dao, Shengsi County, Zhejiang Province, is now supplying power to the grid for the first time. Blades 21 meters in diameter are mounted on a steel tower 15 meters high which in turn is perched on a hilltop 90 meters above sea level. The egg-shaped machinery housing contains the wind turbine, the governor, the brake, and the generator. The total weight is 8.7 tons. The housing moves freely with the direction of the wind, continuously catching the maximum wind energy by use of a wind vane and a control and transmission mechanism. Even though the energy of the wind may change instantaneously, the windmill employs a governor and adjustment machinery to automaticaly change the pitch of the blades according to the velocity of the wind. In strong winds or light, the voltage will remain stable at 390 volts with the frequency regulated at 50 hertz, providing better conditions for feeding electricity into the grid. After joining the grid, the power will be regulated at below 40 kilowatts so that power may be fed safely into the grid. From a standpoint of safety and reliability, should the voltage, current, or load be exceeded during operations, there are safeguards and automatic switches to handle the problem. Even if a typhoon or thunderstorm strikes, the unit will be safe and sound. The operation is handled completely from a control room on the ground.

Experimental 40-kilowatt wind-powered generators are important national S&T projects. With assistance from the various levels of authority, personnel from seven units, including the provincial machinery research institute, the science and technology office of the provincial power bureau, and the Shengsi County Science Committee, have been cooperating for more than 5 years under difficult conditions to make this project a success.

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SUPPLEMENTAL SOURCES

EXPERIMENTAL VILLAGES TO TEST FEASIBILITY OF ALTERNATIVE ENERGY APPLICATIONS

OW281427 Beijing XINHUA in English 1220 GMT 28 May 83

[Text] Beijing, May 28 (XINHUA correspondent Li Jinqi)--Experiments will be held in five villages scattered across the country to find the best way to solve the rural energy shortage. This was decided at a current meeting on rural energy research and development planning in Beijing.

When construction is completed in 1987 of the five villages, in Guangdong, Sichuan, Hebei, Heilongjiang and Shanxi provinces, they will become examples for other villages in their regions to follow.

At present, average Chinese villages fall short of fuel 2 months out of the year.

The meeting is sponsored by the Academy of Sciences, which has listed rural energy as one of its major research projects in the coming few years. The meeting is attended by 120 scientists and professors from research institutes, government departments, universities and science and technology commissions in various localities.

It has been learned from authoritative quarters at the meeting that since the country's fuel such as coal, oil, electricity, and natural gas is limited, rural areas will have to find new resources and make use of methane gas, solar energy, wind power, geothermal energy and fast-growing trees.

It has been decided to make use of 80 methane generating pits and solar energy in Xinbu production brigade, Shunde County, in Guangdong Province. The brigade is using solar energy to process silkworm cocoons and other farm produce and to pump piped water. By 1985, most of the peasant households will be serviced by biogas and solar energy.

The Changle brigade in the southern suburbs of Chengdu, in the densely populated Sichuan Province, will be built into a biogas experimental center by using the only local energy resources--nightsoil, domestic animal dung, and wheat stalk and paddy straw.

The rural energy experimental village in Luancheng County, Hebei Province, abounds in wheat and corn stalks for methane generation and has rich solar

energy. The village will use biogas to generate electricity for irrigation and for household use.

The experimental village in Hailun County, Heilongjiang Province, will focus on the planting of fast growing trees for firewood, supplemented with biogas and solar energy. By adopting the technology of gasification in charcoal making, gas will be provided to its villagers for cooking and heating in winter. The village will use biogas in summer.

The village in Daixian County, Shanxi Province, will use local coal resources to produce gas by simple gasification stoves for electricity and heating, processing farm and sideline products, as well as to provide 300 to 400 households with piped gas. Three-fourth of the counties in Shanxi Province have coal resources. The experience of the village will be applied to vast rural areas in Shaanxi, Gansu, and Xinjiang, where coal resources are abundant.

CSO: 4010/67

SUPPLEMENTAL SOURCES

STATUS OF BIOGAS RESEARCH AND DEVELOPMENT IN CHINA REVIEWED

Beijing TAIYANGNENG /SOLAR ENERGY/ in Chinese No 1, 28 Feb 83 pp 10-11

/Article by Liu Kexin /0491 0344 9515/

/Text/ The earliest research and utilization of marsh gas in China began in the 1920's. In 1930, the Guorui Gas Company was founded in Shanghai and branches were established in some provinces and cities. A number of technicians was trained who promoted the popularization and utilization of marsh gas in China. Now, some marsh gas pits built then can still be seen in many provinces and cities. Some are still in perfect condition.

After liberation, and especially after 1970, marsh gas research and application developed rapidly. Several million pits have already been built throughout the nation and there are about 800 marsh gas power stations and 1,000 small-scale marsh gas electric power generating stations. Marsh gas can be directly used as fuel for daily living and for generating electricity, pumping water, and processing agricultural sideline products. There are more than 50 marsh gas research units throughout the nation. They are mainly engaged in the study of building pits, fermentation, developing burners, using marsh gas to generate electricity, and making economic evaluations of marsh gas. The thermal efficiency of several types of marsh gas burners in our nation has surpassed 60 percent, and low-pressure burners have also been successfully trial produced. Models of single fuel (burning marsh gas) and dual fuel (mixed combustion of oil and gas) marsh gas generators to generate electricity have been built and some have been produced in batches. The conservation of oil in the dual-fuel marsh gas generator to generate electricity reaches 70 to 80 percent.

I. The Development of the Types of Marsh Gas Pits

The marsh gas pits that have already been built in our nation are mainly distributed in the rural areas. As the utilization of marsh gas becomes popular and research continues in depth, the types of marsh gas pits are also continually being improved. Various types of pits have emerged. From 1970 to 1973, mainly rectangular marsh gas pits were popularized (Figure 1). After 1973, circular marsh gas pits became popular. At the beginning, the pits were deep. Later, they developed into "circular, small, shallow" marsh gas pits (Figure 2). This type of marsh gas pit is the "Chinese-style" marsh gas pit that is widespread and popular at present.

In 1979, Zhejiang and Shanghai popularized a separation type marsh gas pit. The gas tank and the pit of this marsh gas pit are separated. The gas tank is a floating cap structure, the same as the gas tank of the Indian marsh gas pits.

In the past 2 years, some new types of marsh gas pits have also emerged, such as the plastic and red mud plastic marsh gas pits and marsh gas pits that utilize solar energy for heating.

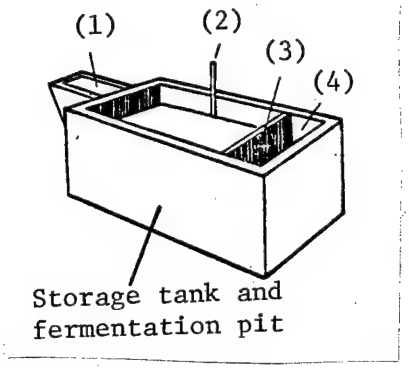

Figure 1. Rectangular marsh gas pit

Key:
1. Intake
2. Gas tube
3. Connecting hole
4. Residue trough

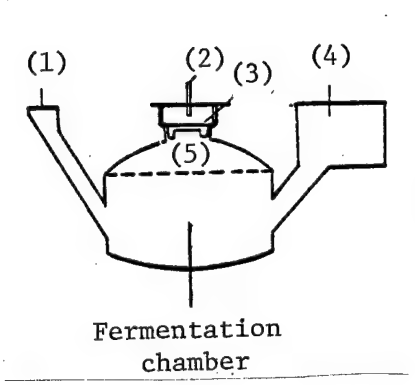

Figure 2. Circular marsh gas pit

Key:
1. Intake
2. Gas tube
3. Removable cap
4. Residue chamber
5. Gas storage tank

Table 1

Item	Gas production rate (liter/liter·day)	Rate of decomposition (%)
Raw materials		
Corn stalks	0.56	61.16
Wheat stalks	0.56	55.0
Hay	0.45	53.33
Hog manure	0.51	48.34
Human excrement	0.43	62.26
Cattle dung	0.12	21.68

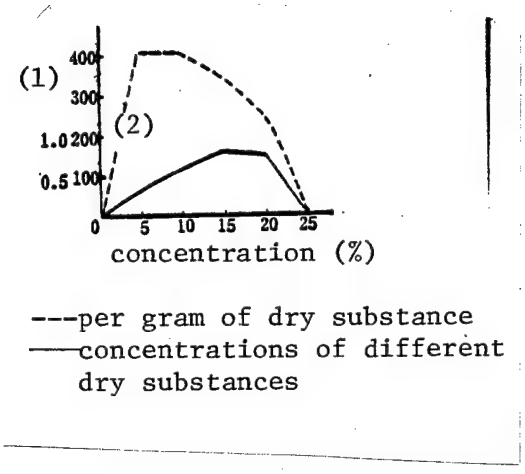

Figure 3. Relationship between the concentration of dry substance of commonly used raw material in rural areas and the amount of gas produced.

Key:
1. Gas produced by dry substances of different concentration
2. Gas produced per gm of dry substance

II. Research in the Technical Process of Marsh Gas Fermentation

In recent years, research surrounding the technical process of marsh gas fermentation in rural areas has been conducted in the pretreatment of raw materials, concentration of ingredients, inoculating substances, amount of gas produced, additives, temperature, and the relationship between the plant composition and rate of gas production. Considerable progress has been made.

1. The Rate of Gas Production and the Rate of Decomposition of Raw Materials

The rate of gas production and the rate of decomposition of several types of raw materials commonly used in rural areas after fermentation under 35°C for 3 months (stalks) and for 2 months (manure) are listed in Table 1. It can be seen from the table that the rates of gas production of corn stalks and wheat stalks are the highest, and the rate of decomposition of human excrement and corn stalks are the highest.

2. The Effect of the Concentration of Dry Substance Upon the Amount of Gas Produced

Figure 3 shows that in rural marsh gas fermentation pits, the amount of gas produced is the highest when the concentration of dry substance is 15 percent. When the concentration of the dry substance is 5 to 10 percent, the amount of gas produced per gram of dry substance is the highest. At present, the concentration of dry substance of the ingredients in rural marsh gas pits in our nation is generally 8 to 10 percent.

3. Effect of Inoculating Substances Upon the Amount of Gas Produced

The ingredients in rural marsh gas pits generally contain 10 percent of added mud (marsh gas pit, cesspool or ditches) as the inoculating substance. It can be seen from Figure 4 that the inoculating substance not only can increase the amount of gas produced, it can also shorten the 3 to 5-day startup period. If the amount of inoculating substance is large, there will be almost no stagnant period.

4. The Effect of Temperature Upon the Amount of Gas Produced

The temperature in the pit greatly affects the amount of gas produced. For example, in some marsh gas pits in China's south, the temperature in the pit in summer is 24 to 31°C and the rate of gas production reaches 0.21 to 0.55 cubic meters/cubic meter·day, but in winter, the temperature in the pit drops 12 to 17°C, and thus the rate of gas production correspondingly drops to 0.07 to 0.1 cubic meters/cubic meter·day. At some places, the use of a simple solar energy device to heat the marsh gas pit can raise the temperature in the pit by 2 to 5°C, and thus the rate of production of gas can be visibly increased (Figure 5).

5. Maintaining Normal Gas Production

Under normal conditions, China's rural marsh gas pits begin to produce gas 5 to 7 days after materials have been placed, and peak gas production is reached in 7 to 9 days. The marsh gas pits using human and animal excrement and green grass as raw materials can produce gas for about 75 days. When using stalks as the main raw material for fermentation, the production of gas can persist for about 2 months. After the amount of gas produced visibly drops, new materials must be added according to the amount of volatile acids and the pH value. Acetic acid should be below 2,000 ppm, the pH value must be controlled within 6.5 to 7.5, and generally 0.7 to 1 percent of materials should be fed into the pit per day.

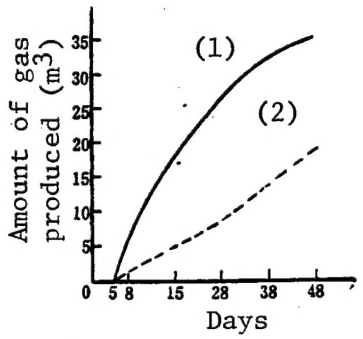

Figure 4. Comparison of gas output from pit with inoculating substance and pit without inoculating substance

Key:
1. Experimental pit (inoculating substance added)
2. Control pit (inoculating substance not added)

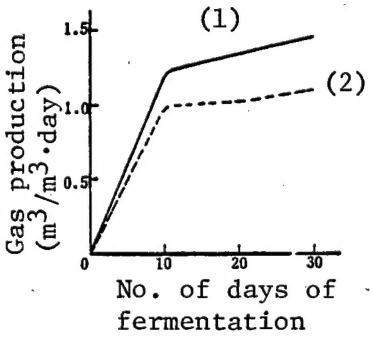

Figure 5. The use of solar energy heating to increase the rate of gas production

Key:
1. Experimental pit (heated by solar energy)
2. Control pit

III. Study of Microorganisms in Marsh Gas Fermentation

In recent years, the study of microorganisms in marsh gas fermentation has been conducted widely in our nation. The Chengdu Biology Institute of the Chinese Academy of Sciences reported on six types of hydrogen-producing bacteria in marsh gas pits and their mutual action with methanobacteria. The Beijing Teachers College produced a culture of a strain of sarcina methanica. Wuhan University reported on a strain of spontaneous nitrogen-fixing bacteria in marsh gas pits. The Zhejiang Agricultural University and the Hebei Teachers University studied the pattern of variation in the quantity of non-methanobacteria and methanobacteria in the course of fermentation of marsh gas.

In addition, many units launched studies in the concentration of cultures of marsh gas fermentation bacteria and realized some achievements which have been applied in production.

IV. Results of Disinfection and Killing of Larvae in Marsh Gas Fermentation

One of the raw materials of the marsh gas pit--manure--contains larvae. In the course of fermentation and decomposition in the marsh gas pit, larvae will gradually settle to the bottom of the pit, therefore, fermentation in the marsh gas pit is effective in settling larvae. According to measurements taken by the Sichuan Provincial Parasitic Diseases Research Institute, the rate of settlement in a marsh gas pit can reach 79.7 percent. The larvae of blood flukes and hookworms in the pits basically die out within 3 months. When ammonia water or urea is used to treat the settled residue, all of the live larvae in the settled residue can be killed. According to experimental results in Jiangsu and Sichuan, when the concentration of ammonia in the settled residue reaches 0.33 percent, the larvae of hookworms will all die within 4 days. When the concentration of ammonia is 1.16 to 1.61 percent, the larvae of roundworms will all die within 9 days. In a 5 percent urea solution, all larvae of roundworms will die within 4 days, and typhoid and dysentery bacilli will all die within 2 days. Therefore, the popularization and utilization of marsh gas in rural areas serve to control rural schistosomiasis and ancylostomiasis. The rate of occurrence of such diseases can be lowered by more than 70 percent.

V. Fertility of Marsh Gas Manure

Marsh gas manure as a fertilizer produces a visible result in increasing the output of farmland. Generally, the scale of the increased output is 3 to 10 percent and even higher.

According to measurements taken by the Soil and Fertilizer Institute of the Hubei Provincial Agricultural Institute, the amount of immediately effective nitrogen after fermentation of agricultural wastes constitutes 50 to 70 percent of the total amount of nitrogen, the amount of immediately effective phosphorus constitutes 5 to 10 percent of the total amount of phosphorus, and the amount of immediately effective potassium constitues 60 to 70 percent of the total amount of potassium.

The results of measurements by the Sichuan Provincial Agricultural Institute shows that the content of organic matter in the fermented and settled residue of marsh gas is abundant. It contains 39.2 percent total organic matter, 1.03 percent nitrogen, 0.718 percent phosphorus, and it is a good soil improving agent. It increases soil fertility and the granular structure of soil.

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CSO: 4013/165

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